SCIENTIFIC AMERICAN

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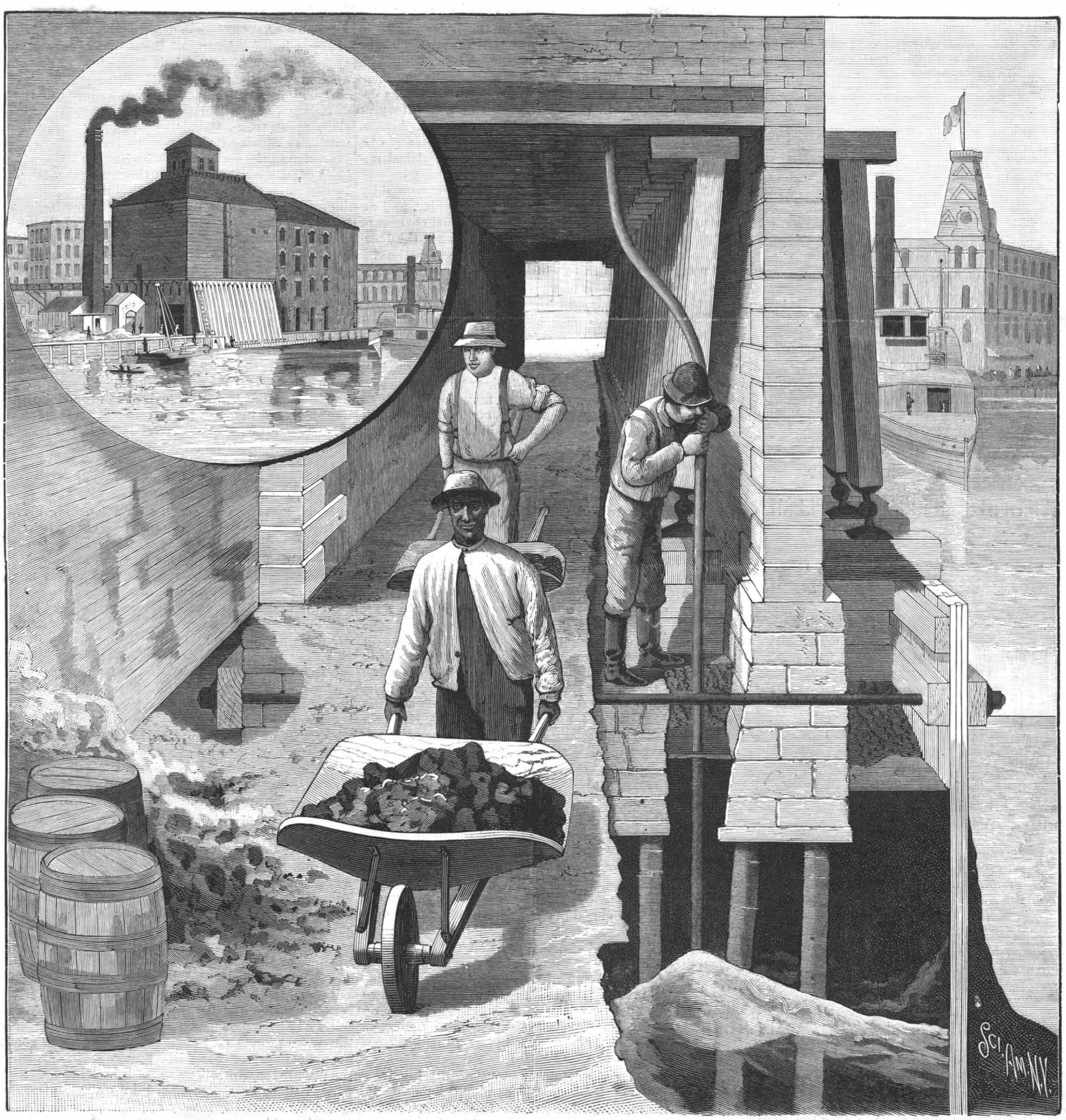
REPAIRING A FOUNDATION.

An interesting piece of engineering work has been recently completed at the Columbia Elevator, Providence, R. I. It consisted in constructing a new foundation wall under a large, substantial brick building, without seriously disorganizing its internal arrangement, and without great expense. The building consists of a brick storehouse and, separated by a brick wall, a wooden granary (slated), with the two lower stories, which are used for milling purposes, built of brick. Serious cracks had occurred in the brick walls in the north and east sides of the building, containing the milling and granary departments which made it evident that steps should be taken to prevent the structure from falling about the ears of the occupants. Upon examination it was found that the ground where the building was erected, and which formerly was a low marsh, was so springy and soft that the wash from the steamers constantly coming into an adjoining slip, and the movement of the tides, had affected the stability of the piles upon which the foundation wall had been erected. The dredging carried on in the harbor had also added its share of the work of destruction. The piles were pushed out under the thrust caused by the weight of the building, and, not having any backing at the top to hold them, cracks large enough to receive the doubled fist had appeared in the brick walls.

The work of reconstruction was put in the hands of Mr. J. Herbert Shedd, C.E., and the general plan decided upon was the laying of a concrete bed under the wall, and its subsequent rebuilding while the structure was temporarily sustained on beams and jack screws. The first steps taken were the building of a bulkhead almost parallel with the north wall, of sheet piling, made up of sticks of Southern pine, 8 inches thick by 12 or 14 inches wide, and about 30 feet in length. Each stick was grooved to receive a 2 inch spline, and, in order to drive each pile as close as possible to its neighbor, the side next to the adjoining pile was beveled, thus assuring its close contact. The spline was driven after each pile, serving as a guide for the next, and rendering the wall more solid and tight. The piles were held while being driven by two stringers, which were used as guides. Both the hydraulic system and the steam hammer were employed in driving the piles. As may be seen by examining the plan, the piling was turned in at each end to prevent the inflow of water at these points.

In order to tie the bulkhead firmly in position, 3 inch iron bolts were passed through the north and the inner

(*Continued on page* 194.)



PROVIDENCE, R. I.—REPAIRING THE FOUNDATIONS OF A LARGE GRAIN MILL AND ELEVATOR.

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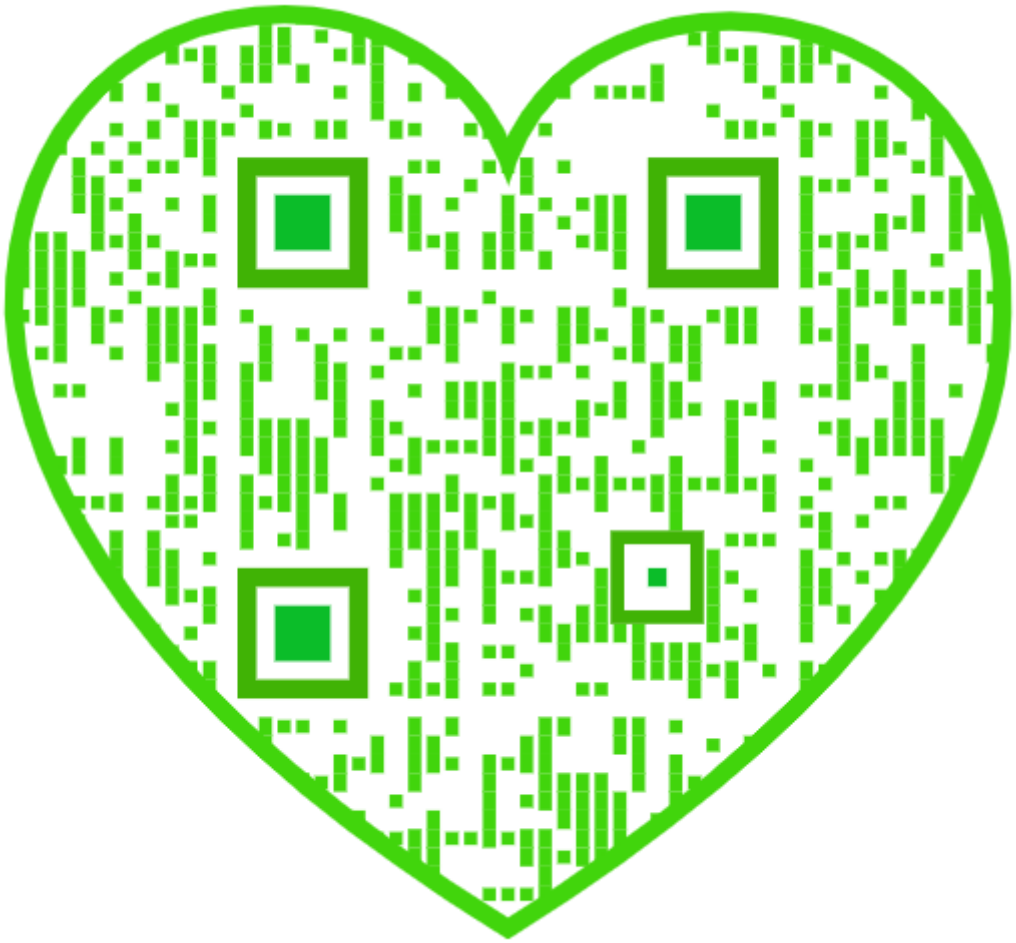

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THE BELL TELEPHONE CASES DECIDED—THE PATENT SUSTAINED.

The judgment of the Supreme Court in the long delayed telephone cases was delivered March 19. The following were the cases:

Amos E. Dolbear *et al.*, *Appellants*, *vs.* The American Bell Telephone Co.	U. S. C. C. Mass.
The Molecular Telephone Co. *et al.*, *vs.* The American Bell Telephone Co. *et al.* [Cross appeal in the same case.	*Appellants*, U. S. C. C. S. D. N. Y.
The Clay Commercial Telephone Co. *et al.* *vs.* The American Bell Telephone Co. *et al.*	U. S. C. C. E. D. Pa.
The People's Telephone Co. *et al.*, *vs.* The American Bell Telephone Co. *et al.*	*Appellants*, U. S. C. C. S. D. N. Y.
The Overland Telephone Co. *et al.*, *vs.* The American Bell Telephone Co. *et al.*	*Appellants*, U. S. C. C. S. D. N. Y.

The opinion was written by the late Chief Justice Waite. We make the following abstracts:

"The important question which meets us at the outset in each of these cases is as to the scope of the fifth claim of Bell's patent of March 7, 1876, which is as follows:

"'The method of and apparatus for transmitting vocal or other sounds telegraphically, as herein described, by causing electrical undulations similar in form to the vibrations of the air accompanying the said vocal or other sounds, substantially as set forth.'

"It is contended that this embraces the art of transferring to or impressing upon a current of electricity the vibrations of air produced by the human voice in articulate speech, in such a way that the speech will be carried to and received by a listener at a distance on the line of the current. Articulate speech is not mentioned by name in the patent. The invention as described consists in the employment of a vibratory or undulatory current of electricity, in contradistinction to a merely intermittent or pulsatory current, and of a method of and apparatus for producing electrical undulations upon the line wire.

"A pulsatory current is described as one caused by sudden or instantaneous changes of intensity, and an electrical undulation as the result of gradual changes of intensity, exactly analogous to the changes in the density of air occasioned by simple pendulous vibrations.

"Among the uses to which this art may be put is said to be the telegraphic transmission of noises or sounds of any kind; and it is also said that the undulatory current, when created in the way pointed out, will produce through the receiver at the receiving end of the line a similar sound to that uttered into the transmitter at the transmitting end. One of the means of imparting the necessary vibrations to the transmitter to produce the undulations may be the human voice. Articulate speech is certainly included in this description, for it is an uttered sound produced by the human voice."

"In this art, or, what is the same thing under the patent law, this *process*, this *way* of transmitting speech, electricity, one of the forces of nature, is employed; but electricity left to itself will not do what is wanted. The art consists in so controlling the force as to make it accomplish the purpose.

"It had long been believed that if the vibrations of air caused by the voice in speaking could be reproduced at a distance by means of electricity, the speech itself would be reproduced and understood. How to do it was the question. Bell discovered that it could be done by gradually changing the intensity of a continuous electrical current, so as to make it correspond exactly to the changes in the density of the air caused by the voice. This was his art. He then devised a way in which these changes of intensity could be made and speech actually transmitted. Thus his art was put in a condition for practical use. In doing this, both discovery and invention, in the popular sense of those terms, were involved—discovery in finding the art, and invention in devising means of making it useful; and for such discovery and such invention the law has given the discoverer and inventor the right to a patent—as discoverer for the useful art, process, and method of doing the thing he has found, and as inventor for the means he has devised to make the discovery one of actual value. Other inventors may compete with him for the ways of giving effect to the discovery, but the new art he has found will belong to him and those claiming under him, during the life of his patent. If another discovers a different art or method of doing the same thing, reduces it to practical use, and gets a patent for his discovery, the new discovery will be the property of the new discoverer, and thereafter the two will be permitted to operate, each in his own way, without interference by the other. The only question between them will be whether the second discovery is in fact different from the first.

"A patent for the art does not necessarily involve a patent for the particular means employed for using it. Indeed, the mention of any means in the specification or descriptive portion of the patent is only necessary to show that the art can be used; for it is only useful arts, arts which may be used to advantage, that can be made the subject of a patent. The language of the statute is:

"'Any person who has invented or discovered any new or useful art, machine, manufacture or composition of matter may obtain a patent.'"

"What Bell claims is the art of creating changes of intensity in a continuous current of electricity exactly corresponding to the changes of density in the air caused by the vibrations which accompany vocal or other sounds, and of the use of the electric condition that is thus created for sending and receiving articulate speech telegraphically. For that, among other things, the patent of 1876 was, in our opinion, issued, and the point to be decided is whether as such a patent it can be sustained."

"An effort was made in the argument to confine the patent to the magneto instrument, and such modes of creating electrical undulations as could be produced by this form of apparatus, the position being that such an apparatus necessarily employed a closed circuit incapable of being opened, and a continuous current incapable of being intermittent. But this argument ignores the fact that the claim is, first, for the process, and, second, for the apparatus. It is to be read as, *first*, a claim for the method of transmitting vocal or other sounds telegraphically, as herein described, by causing electrical undulations similar in form to the vibrations of air accompanying the vocal or other sounds, substantially as set forth, and, *second*, for an apparatus for transmitting vocal or other sounds telegraphically as herein described, by causing electrical undulations, substantially as set forth.

"The *method* 'as herein described' is to cause gradual changes in the intensity of the electrical current used as the medium of transmission, which shall be exactly analogous to the changes in the density of the air occasioned by the peculiarities in the shapes of the undulations produced in speech, in the manner substantially as set forth, that is to say, by the vibration or motion of bodies capable of inductive action, or by the vibration of the conducting wire itself in the neighborhood of such bodies, which is the magneto method, or by alternately increasing and diminishing the resistance of the circuit, or by alternately increasing and diminishing the power of the battery, which is the variable resistance method. This is the process which has been patented, and it may be operated in either of the ways specified. The circuit must be kept closed to be used successfully, but this does not necessarily imply that it must be so constructed or so operated upon as to be incapable of being opened. If opened, it will fail to act for the time being, and the process will be interrupted, but there is nothing in the patent which requires it to be operated by instruments which are incapable of make and break. The *apparatus*, 'as herein described,' which is included in the claim, is undoubtedly one in which the electro magnet is employed, constructed substantially as set forth in the specification. The one acting on the variable resistance mode is not described, further than to say that the vibration of the conducting wire in mercury or other liquid included in the circuit occasions undulations in the current, and no very specific directions are given as to the manner in which it must be constructed. The patent is both for the magneto and variable resistance *methods*, and particularly for the magneto *apparatus* which is described or its equivalent. There is no patent for any variable resistance *apparatus*.

"It is undoubtedly true that when Bell got his patent, he thought the magneto method was the best. Indeed, he said in express terms he preferred it. But that does not exclude the use of the other, if it turns out to be the most desirable way of using the process under any circumstances. Both forms of apparatus operate on a closed circuit by a gradual change of intensity, and not by alternately making and breaking the circuit or by sudden and instantaneous changes, and they each require to be so adjusted as to prevent interruptions. If they break, it is a fault, and the process stops until the connection is restored."

"We come now to consider the alleged anticipation of Philipp Reis; and here it is to be always kept in mind that the question is not whether the *apparatus* devised by Reis to give effect to his theory can be made with our present knowledge to transmit speech, but whether Reis had in his time found out a way of using it successfully for that purpose, not as to the character of the apparatus, but as to the mode of treating the current of electricity on which the apparatus is to act, so as to make that current a medium for receiving vibrations of air created by the human voice in articulate speech at one place, and in effect delivering them at the ear of the listener in another place. Bell's patent is not alone for the particular apparatus that he describes, but for the process that apparatus was designed to put into use. His patent would be just as good if he had actually used the Reis apparatus in developing the process for which it was granted. That Reis knew what had to be accomplished in order to transmit speech by electricity is very apparent, for in his first paper he said:

"'Since it is possible to produce anywhere or in any

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manner vibrations whose curves shall be the same as those of any given tone or combination of tones, we shall receive the same impression as that tone or combination of tones would have produced on us.'"

"Reis discovered how to reproduce musical tones, but he did no more. He could sing through his telephone, but he could not talk. From the beginning to the end he has conceded this. In his first paper he said:

"'Hitherto it has not been possible to produce the tones of human speech with a distinctness sufficient for every one. The consonants are for the most part reproduced pretty distinctly, but the vowels as yet not in an equal degree. The cause of this I will attempt to explain.'

"And again:

"'I have succeeded in constructing an apparatus with which I am enabled to reproduce the tones of various instruments, and even to a certain extent the human voice.'

"None of the many writers whose papers are found in the records claim more than this for Reis or his discovery."

"We have not had our attention called to a single item of evidence which tends in any way to show that Reis, or any one who wrote about him, had in his mind anything else than that the intermittent current caused by the opening and closing of the circuit could be used to do what was wanted. No one seems to have thought that there could be any other way. All recognized the fact that the minor differences in the original vibrations had not been satisfactorily reproduced, but they attributed it to the imperfect mechanism of the apparatus used rather than to any fault in the principle on which the operation was made to depend.

"It was left for Bell to discover that the failure was due, not to workmanship, but to the principle which was adopted as the basis of what was to be done. He found that what he called the intermittent current, one caused by alternately opening and closing the circuit, could not be made, under any circumstances, to reproduce the delicate forms of the air vibrations caused by the human voice in articulate speech, but that the true way was to operate on an unbroken current, by increasing and diminishing its intensity. This he called a vibratory or undulatory current, not because the current was supposed to actually take that form, but because that language expressed with sufficient accuracy his idea of a current which was subjected to gradual changes of intensity, exactly analogous to the changes of density in the air occasioned by its vibrations. Such was his discovery, and it was new. Reis never thought of it, and he failed to transmit speech telegraphically. Bell did, and he succeeded. Under such circumstances, it is impossible to hold that what Reis did was an anticipation of the discoveries of Bell. To follow Reis is to fail, but to follow Bell is to succeed. The difference between the two is just the difference between failure and success. If Reis had kept on, he might have found out the way to succeed, but he stopped and failed. Bell took up the work and carried it on to a successful issue."

The other alleged anticipations of Bell's invention are then discussed, including those of Van der Weyde, McDonough, Varley, and Drawbaugh, all of which are dismissed as untenable. The decision is sustained by four of the judges, while three of them dissent, believing Drawbaugh to be the prior inventor.

At the conclusion of the reading of the opinion of the court, Mr. Justice Bradley said that: "Mr. Justice Field, Mr. Justice Harlan, and myself are not able to concur with the other members of the court in the result which has been reached. The point on which we dissent is the question of Drawbaugh's invention. We think that Drawbaugh did anticipate the invention of Mr. Bell. We think that the evidence to that point is so overwhelming, both with regard to the number and character of the witnesses, that it cannot be overcome. Of course, it is a question of fact depending upon the weight of the evidence, and involves no question of law, and therefore it is a matter that does not require much observation on the part of those who dissent from the opinion, which is very ably drawn, and undoubtedly presents the whole case with great force. But on this point we cannot concur in the views of the court. We think that Drawbaugh did have an instrument in his shop as early as 1869 which used the variable resistance instrumentality in transmitting articulate speech to a distance, by means of electricity, and was distinctly heard and understood. That is the whole invention, so far as variable resistance is concerned.

"We also think that as early as 1871 he did produce an instrument employing the magneto-electric instrumentality altogether, substantially the same as that which is claimed in Mr. Bell's patent. In the one case, with regard to the variable resistance principle, over seventy witnesses were produced. The evidence of some of them may have been shaken with regard to the time that they had in mind; but the evidence of the great majority of them is not shaken at all. They were mostly plain people of the country, but they heard the words, and that is a matter that they could not be mistaken about. It did not require science nor literature nor refinement to understand that.

"In regard to the other instrument, some forty or fifty witnesses were produced who saw it. Many of them heard the language produced through it, and a number of witnesses who did not hear the language produced through these instruments saw them or heard them talked about, so as to fix the time that they were in existence, and it seems to us that on this subject of time and of result there is such a cloud of witnesses that it is impossible not to give credence to them. There is no doubt that Mr. Bell's merits are very great in appreciating the importance of the discovery, and in bringing it before the public in such a manner as to make it appear to be what it is, one of the most important discoveries of the century. He was a man whose professional experience and whose scientific attainments enabled him to see at a glance the importance of it. Drawbaugh was a different sort of man. He did not see it. Had he done so, he would have taken measures to interest persons with him in it, and have brought it out. He was a mechanic, a plain mechanic, somewhat better instructed, perhaps, than most ordinary mechanics, a man of more reading, a man of more intelligence. But he looked upon what he made more as a curiosity than a matter of speculation, a matter of financial importance or of importance to the public. This is the way we view his condition of mind in regard to it, and explain why he had not taken more pains to bring it forward to the notice of the public. It is the tendency of the human mind to attach importance to the results and inventions of those who have achieved eminence. Watt was the idol of the British nation, from the time of his first invention of the steam engine until the day of his death, and until the present time; and everything that was invented about the steam engine was attributed to him. It was the glory of England, the glory of Watt, and of course every patriotic British subject would hoot at anything it was claimed Watt did not invent, or attribute it to him. That is a principle of the human mind on which we think a great deal may be explained with regard to the feeling toward this important service which Mr. Bell has rendered with regard to this invention. The plain mechanic of Pennsylvania is of no account. The scientific and illustrious—for he is illustrious—Mr. Bell, it cannot be but that he did invent this thing! And yet if Mr. Bell on the 14th day of January (I think it was) or February, when he applied for his patent at the Patent Office, had had in his laboratory the things that Drawbaugh had, he would have been filled with an excitement far exceeding that which has animated the great inventors of the world when they made the discoveries they have made, and he would have exclaimed: 'Eureka! Eureka!' He would have appreciated it, if Drawbaugh did not.

"What had he when he applied for his patent? On the 10th of June, 1875, they thought they heard something, but were not sure; but he knew the principle, and he patented it. Up to the time of making his application for a patent they had not succeeded in producing intelligible speech, more than a word or two; perhaps a word or two. If Bell had done at that time as much as Drawbaugh had done, according to the evidence, he would have had no hesitation in claiming the greatest discovery that the world has seen in the present century.

"This is an outline of the views which we have on this subject. We have nothing to say depreciatory of Mr. Bell at all, for he has real merits; but we think that this obscure mechanic did do the thing, and that he is entitled to the merit of being the first inventor.

"We will take an opportunity within a few days to write a further statement and file it."

CHIEF JUSTICE WAITE.

At six o'clock on the morning of March 23 occurred the death of Judge Morrison Remich Waite, the Chief Justice of the Supreme Court of the United States, and the seventh incumbent of that dignity. He was born in Lyme, Conn., November 29, 1816. In 1837 he graduated from Yale College and took up the study of law. He settled in Maumee City, Ohio, and there practiced his profession. In 1849 he was a member of the State legislature. A year later, he moved to Toledo. He was acquiring much influence in the political life of the day, and declined many offers of nominations to Congress, and refused also a seat on the bench of the State of Ohio Supreme Court. In 1871–72 he was one of the counsel for the United States before the Geneva Arbitration Tribunal. In 1873 he presided over the Constitutional Convention of his adopted State. On January 21, 1874, he received his appointment as Chief Justice of the United States, and has since devoted himself entirely to the duties of that position. He had written the decision in the telephone cases. Although far from well, he insisted upon attending the session of the court on March 19, when it was read. Judge Blatchford performed this duty, owing to the illness of the Chief Justice. As soon as possible after the reading, he drove home, and since then never rallied. Owing to his position, many adjournments of the courts throughout the country were taken.

Electricity in the Hotel Ponce de Leon, St. Augustine.

Mr. H. M. Flagler has, in his famous hotel, the largest isolated plant for supplying electricity in this country, or, in fact, in the world.

It consists of four Babcock & Wilcox multitubular boilers, each of which has a nominal rating of 107 horse power; four Armington & Sims engines, three of 60 horse power and one of 125.

Each of the 60 horse power engines drives an Edison dynamo of the latest type, having a capacity of 640 sixteen-candle lights. The other engine drives two machines of the No. 16 type. The rating given is nominal, as the plant admits of an increase in power of 25 per cent over and above the rating.

It is doubtful if there exists another electric light plant with so perfect a system of control and regulation.

Each dynamo has its own regulator, which controls the amount of electricity produced, and indicators showing the volume and pressure of the electricity.

The machines are all connected to heavy bars of flat copper, termed "omnibus wires," with which, by a switch in the headboard of the machines, they may instantly be connected or disconnected. To the "omnibus wires" are connected a series of heavy copper cables, called "feeders," which pass to the most important centers of lighting in the hotels Ponce de Leon and Alcazar. No lamps are directly connected to these "feeders," but they carry the current to the local distributing points, from which a large number of smaller wires, "mains," lead the electricity to the "services." These in turn conduct it directly to the lamps in the buildings.

Danger from fire by this system—the Edison—is reduced practically to *nil*. At the junction points of the "'bus wires," "feeders," and "mains," are inserted fuses, composed of an alloy of lead and tin, which volatilizes at a temperature of 400°. If, by any accident, the copper wires conducting the electric current should come in contact with each other, before the temperature of the copper could be raised sufficiently to set fire to any inflammable substance in proximity to it, the safety fuse would vaporize and open the circuit. As soon as the trouble had been rectified, a fresh fusible plug would be inserted, and the current reestablished in this circuit.

Nor is there any danger to human life from coming into contact with the wires or machinery of the system. The pressure is only of about 100 volts, which any child can receive with impunity.

This plant supplies all the lights used in the hotels Ponce de Leon and Alcazar—in all about 5,500 incandescent lamps.

Apropos of this subject, it will perhaps be of interest to mention an experiment which Mr. Flagler has been trying, in connection with the great artesian well which was, a few months ago, opened on the hotel grounds.

Directly over the well, which throws a solid column of water, 12 inches in diameter, 35 feet into the air, a huge turbine wheel has been placed. Bolted direct to the shaft of this wheel is an Edison dynamo, capable of supplying 375 sixteen-candle lamps. Several hundred Edison incandescent lamps have been placed on the walls of the building over the well, and together with the indicating and regulating apparatus connected with the dynamo. The trials in generating electricity by this way by power derived directly from the earth have proved eminently satisfactory, as far as the steadiness and constancy of the light are concerned; but the power secured has not been so great as was at first anticipated. This, in great measure, is due to the method in which the stand pipe is connected with the turbine, and to the arrangement of the paddles in the wheel, which allows a great deal of water to pass by. Changes are now being made which will obviate these troubles, and it is expected that when these are completed, the steam plant can be shut down late in the evening and not started again until early the following evening, the hydraulic plant furnishing all power necessary for supplying light in the interim.

Hydraulic experts throughout the country have condemned this scheme as impracticable, and have doubted the constancy of the flow of water from the artesian. This, however, has not in three months perceptibly diminished. The experiment is interesting, as being the first case on record where natural water power for driving machinery has been derived directly from the earth. It has been conducted under the supervision of Messrs. Wm. Kennish, an expert in hydraulics, and W. J. Hammer, of Boston, an electrical expert connected with the Edison Electric Light Co., and who is in charge of the entire department of lighting at the Ponce de Leon.

H. BRADFORD ROCKWOOD.

St. Augustine, Fla., March 13, 1888.

FORTY-THREE of Iowa's many schoolhouses are built of logs.

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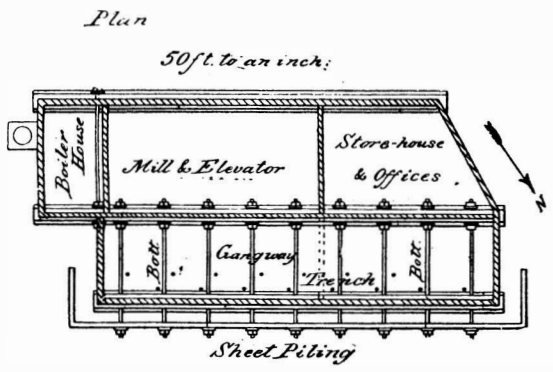
REPAIRING A FOUNDATION.

(*Continued from first page.*)

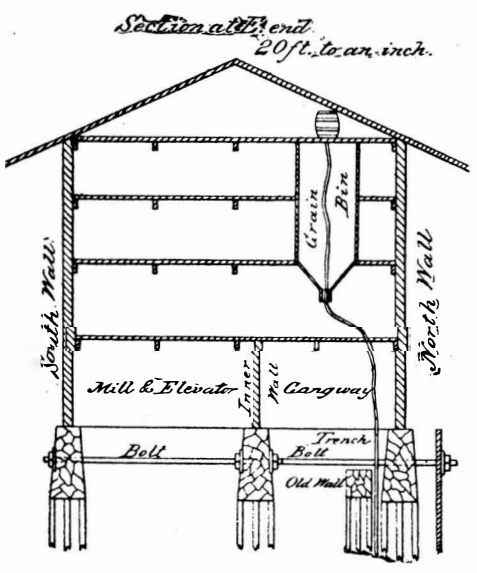
walls at intervals of 16 feet, thus binding the piling firmly in place. At the east end, where the thrust was greatest, a supplementary bolt was used, which passed through the entire building to the south wall, thus bringing the strain equally on the whole building.

After a piece of the sheeting was finished, concrete (1 part hydraulic cement, 2 parts of sand, and 3 parts of gravel) was run in between it and the foundation wall. This filled the larger cavities, and, forming a wall with the sheeting, made a watertight bulkhead. A trench was dug on the inner side of the foundation wall to enable a 20 foot 4 inch pipe to be sunk, through which cement was to be forced to supplement the work that was not completed on the outside.

In order to procure enough head to force the cement



through the pipe, the concrete, consisting of 1 part hydraulic cement and 1 part of sand, was mixed on the fourth floor of the building, at which elevation it was fed into a hose which connected the receiving tank with the pipe in the trench below. This pipe had a head with a hose coupling on the top, and a valve to be opened to relieve undue pressure. Enough water was used in sinking to keep the head free of mud. As the concrete was forced out of the pipe, it spread out, filling the mud cavities under and about the wall, and setting about the old piles, driving the light mud and sand ahead of it, and gradually taking its place. As the cement was very heavy and sank under the pressure, the lighter materials were forced to the surface, where they could be easily removed. When the space about the bottom of the pipe became filled enough to stop the flow, the hose was filled with clear water to the top, and allowed to stand. Sometimes, however, the pressure would break out in a new channel, and then filling would be carried on again. After the concrete had thoroughly set, the pipe would be lifted and the concrete would begin to flow again. The work was carried on in this way until the concrete had been filled in to the required height, when the pipe would be removed and the cavity filled in from the surface with grout. It was necessary to have the line from the barrel to the pipe as straight as possible, with no sudden bends or sags for the material to collect in, as it sets very quickly under pressure. During early stages of the work, the sag of the hose when the pipe was partially drawn up as the filling progressed caused great inconvenience, but this was remedied by swinging the receiving tank and its platform so that it



could be raised and lowered as required. Only the best quality of hose could stand the wear and tear and the weight of the material when the pipe became clogged. It was found convenient to use short pieces of irregular length, which rendered it easy of repair. The pipe was sunk at intervals of about eight feet, about twenty feet behind the place where the driving was going on. After the concrete hardened, the work of repair became similar to that usually followed in building new foundations under old houses, which has been often described in these pages. Beams with jack screws under them were erected upon the concrete and the piling, and these were made to carry the weight of the building, when the wall, as well as that of the lower story of the building, was taken down, as far as the level of mean high water, and the foundation and wall above were then rebuilt on the new and solid bed.

A New Chloride of Gold.

Some years ago a new chloride of gold was discovered by Professor Thomsen, but as his results could not be obtained by other chemists, who did not follow his method of production in its entirety, it has been assumed to be a non-proved discovery. Lately, however, by improved methods, he has completely demonstrated the existence of the new chloride. The process is very simple, and the result beyond dispute. All that is required is gold in a fine state of division and a supply of chlorine gas. He took fifty grammes of finely divided gold, obtained by precipitation of the trichloride with sulphurous acid, and thoroughly washed, and dried to the consistency of thick mud, was placed in a weighed glass tube, a rapid stream of the gas was passed under suitable conditions, and the gold end of the tube slightly heated. Being kept afterward covered with cotton wool, enough of heat was supplied by the process of decomposition to continue that initiated from external sources, and in half an hour the action was completed. The operation was repeated several times with identical results, thus establishing the fixed character of the new salt, whose formula is Au_2Cl_4.—*Br. Jour. Photo.*

AN IMPROVED KNAPSACK.

An invention designed to improve and simplify the form of pack it is necessary for soldiers to carry, and to render the equipment adjustable to all sizes and forms of men, is illustrated herewith, and has been patented by Col. Henry C. Merriam, of the 7th Infantry, U. S. A., headquarters at present at Fort Laramie, Wyoming. The pack is formed upon a rectangular iron frame, its vertical arms being slightly curved, so that when the

MERRIAM'S KNAPSACK.

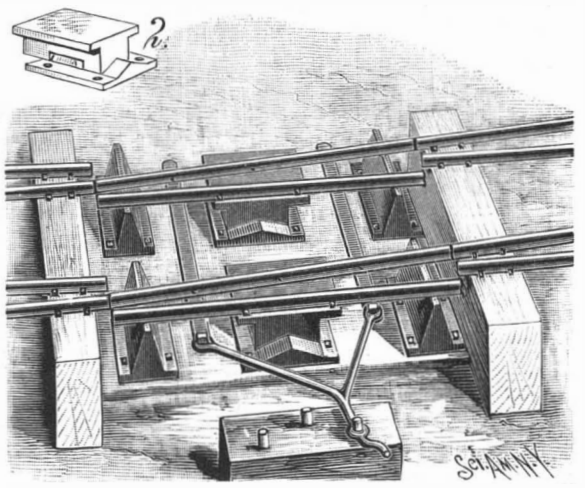
pack is slung to place, its inner face will approximate the contour of the wearer's back. The pack is supported by side braces stepped in sockets carried by the forward ends of a hip strap, whereby the weight is thrown directly upon the strong bones of the hips, thus relieving the shoulders and the spinal column from strain, and preventing pressure upon the shoulder blades. With this form of pack the shoulders and arms are left entirely free for action, and, the cross belts being done away with, the coat of the wearer may be thrown open without deranging the equipment. This pack has been tested at several stations of the army and the marine corps with eminently satisfactory results, it being found that the men can therewith carry a considerably increased quantity of clothing, etc., and with greater ease than is possible with the ordinary form of knapsack. Samples of the improved equipment have also been placed on trial in European armies, and the reports thus far are said to be equally favorable.

Great Waterfalls.

According to a recent calculation, the highest waterfalls in the world are the three Krimbs Falls in the Upper Prinzgau; these falls have a total height of 1,148 ft. The three falls next in height are found in Scandinavia—the Verme Foss, in Romsdal, 984 ft.; the Vettis Foss, on the Sogne Fjord, 853 ft.; the Rjuken Foss, in Thelemarken, 804 ft. With a decrease in height of 213 ft., the three Velino Falls, 591 ft., near Zerni (the birthplace of Tacitus), follow next in order, and they are succeeded by the three Tessa Falls, in the Val Formazza, 541 ft. The Gastein Falls, in the Gastein Valley, 469 ft., rank between the Skjaggedal Foss, in the Hardanger Fjord, 424 ft., and the Boring Foss, in the same fjord. If the width of the falls is taken into consideration, the most imposing are those of the Victoria Falls of the Zambesi, which are 394 ft. high, with a width of 8,200 ft. A long way behind these falls come the Niagara Falls, 177 ft. high and 1,968 ft. wide.

AN IMPROVED RAILROAD SWITCH.

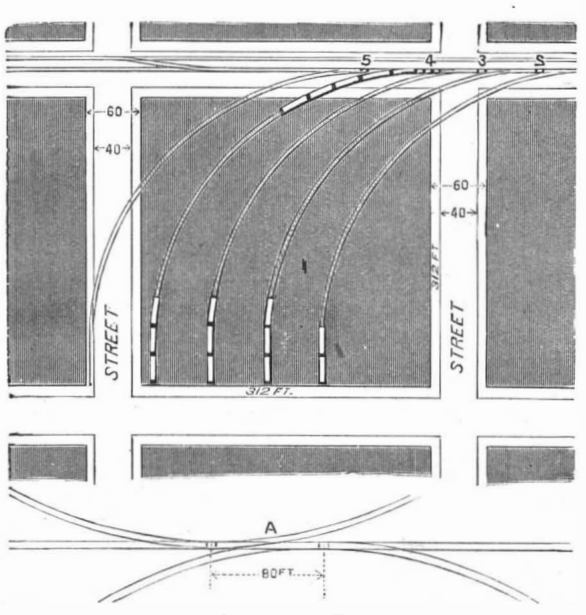
An invention providing a railroad switch of less length than switches now in use, thereby reducing friction, and also enabling the placing of more tracks on a given parallel space than can be done under the present system of switch construction, has been patented by Mr. Isaac M. Brown, of Columbus, Ind., and is illustrated herewith. Sections of three feet long each are cut from the main track rails and securely bolted to the upper portion of V-shaped slides or center rests, the ends of these sections resting on chairs on each side of



THE ISAAC M. BROWN TABLE SWITCH.

the center rests, and one section being inside and the other outside of a throw rail. When a train or car is to be thrown from the main track to the switch track, the switch is drawn back or forced forward by the "throw" at the side. A pivot on the upper surface of each of the sliding center rests passes loosely into a drilled hole on the under side of each of the throw rails, thus permitting the throw rails to be adjusted to the right or left, as may be desired, the ends of the throw rails being connected by rods with the "throw." The sliding center rests and their lower sections, as shown in Fig. 2, have checks or stops, whereby the distance to which the switch is to be moved is regulated.

The switch yard shown represents the long street switch, as now in use in all yards. Yet only three full tracks and two fractions are represented. The first contains room for 9 cars, the next three 11 cars each, and the last 7 cars, thus giving storage for 49 cars. It is claimed that by the use of the Isaac M. Brown improved switch one or more additional full tracks can be put upon the same space. The switches are numbered from 1 to 5, and when a freight comes in it is thrown upon the switch track and run to the right of the yard and cut in sections between streets and alleys. This gives a free passage, as but one section is taken out at a time, and the switching is done in front of the yard, thus saving the wear and tear which occurs in moving a heavy train back and forth to throw a car out here and there. The cars designed for the first station are placed in number 1, and so on to number 4, while number 5 will contain the cars belonging beyond the run. When thus placed in the pockets, the cars in number 5 are moved



THE SWITCH YARD.

out and run down upon the switch track. Then num- 4, and so on to number 1, leaving them in sections, as in the first place, until the train is ready to move out. A train thus managed forms but little obstruction in town or city, the facilities for storage being materially increased on account of the short space occupied by the switch. This plan also leaves the main track entirely unobstructed. Track "A," as represented in the plan of yard, illustrates the utilizing of both sides of a track by four different turnouts, in different directions, by putting in two of these improved switches, with the throw on opposite sides.

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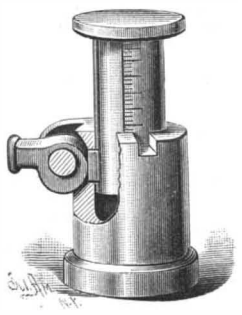
AN IMPROVED EXTENSION GAUGE.

A gauge which is simple and durable in construction, and very easily adjustable for measurement, being especially adapted for machinists' use in planing and turning, is illustrated herewith, and has been patented by Messrs. Fredrick J. Brown and Daniel H. James, of Meadow Brook, Pa. In a base cylinder is held to slide a scale-graduated plunger column, having a groove running parallel with the graduations, and in this groove a loosely fitting block is held in a recess in the base cylinder between ears or lugs. Between these ears is a cam lever turning on trunnions having their bearing in the ears, the cam operating against the outer face of the block to press it into the groove, whereby the plunger column is held in place at the length or height desired, as indicated by the graduations, when a measurement is to be made.



EXTENSION GAUGE OF BROWN & JAMES.

Progress of the Ingersoll Rock Drill Company.

The foreign trade of the Ingersoll Rock Drill Company, of this city, is increasing. Recent orders received were for a complete air compressor plant for driving the Ingersoll power drills at the mines of the Devala-Moyar Gold Mining Company, India, and for the Zancudo mines, United States of Colombia, Central America, a complete plant of duplex air compressor and Ingersoll drills, to be operated by water power, the Ingersoll company furnishing everything between the water power and the mines, has been ordered. This machinery is to be transported over 100 miles on rough roads on mule back, and is made in sections, no piece exceeding 300 pounds in weight. A complete plant, consisting of air compressors, power drills, etc., has been shipped to the Saint Raphael mines, in Zacatecas, Mexico. Under the present management, the business of the Ingersoll company has been largely increased in all directions, and complete equipments of all sorts of mining, tunneling, and quarrying machinery of the most improved patterns are furnished by the company.

NEW SIXTEEN INCH SWING ENGINE LATHE.

We illustrate the new standard pattern, as made by the Putnam Machine Company, Fitchburg, Mass.

It is a modernized lathe of symmetrical and attractive outline, embracing in its construction advanced ideas and improvements.

Driving cone has five shifts for a wide belt. Headstock gears are powerful, speeds are proportioned to give velocities in uniform progression. Live spindle is made from a high grade of crucible steel, is massive. Journals are ground by a special process to secure rotundity and accuracy. Spindle boxes (patented) are interchangeable and easily duplicated, are made from one piece of anti-friction metal, are susceptible of accurate and easy adjustment, and preserve the original alignment of the live and dead centers.

Tail stock has large spindle, broad base, set-over device, tool shelf, and a patent cam screw binder which is not equaled for quickness and efficiency.

Carriage is elevated by back screw, with ball and socket joint, has an unusual area of wearing surface on the "ways," and is improved by its new construction, giving increased rigidity, and lessens the annoyance from chips, etc. Compound rest furnished when ordered.

Feed table is advocated for its versatility and endurance, is of ample power, and responds quickly to the operator, its action for either cross or lateral feeds being smooth, even, and without shock or jar; its range of feed is unequaled, the extra coarse surfacing feed being a new feature.

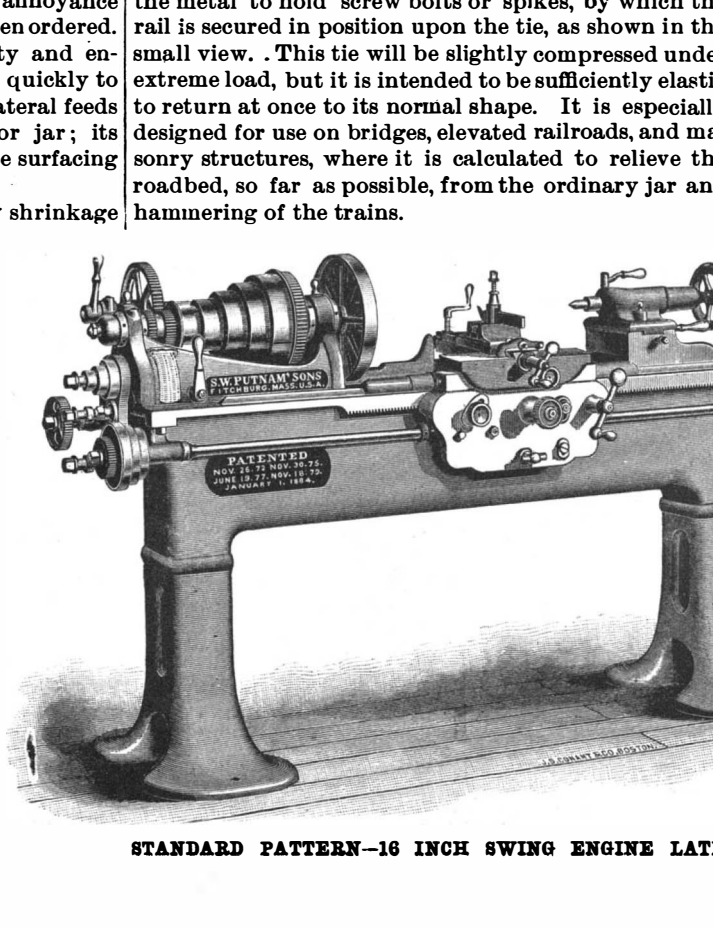
Bed is remarkably free from distortion by shrinkage incident to improper distribution of metal, and is designed to impart strength and resist vibration, deflection, and torsional strains; is braced by a central truss or "backbone," cast solid to the ends, and connected at intervals by cross ties. The "ways" are large, of desirable form, and essentially improved by having the one supporting the front of the carriage at a more obtuse angle than the rear one (patented).

Screw works are strong, constructed in the most approved manner, and by recent improvements the range is largely increased for cutting screws, worms, etc., of coarse pitch; are independent of the feed motions; leading screw (steel) is placed on back side of lathe bed, while the screw nut is operated from the front in connection with a safety stop which obviates breakage by engaging the screw works and feed motion at same time.

Lathe is furnished with countershaft, large and small face plates, open adjustable three-jawed back rest, with lever handle lock nut, traverse rest and wrenches. Abrasive surfaces are seated by hand scraping, and motive parts (including rack) subject to excessive wear or strain are made of steel.

Hollow spindle or taper attachment furnished when desired, at extra cost.

Lathe is made in 6, 8, 10, 12, 14, and 16 feet lengths of bed.



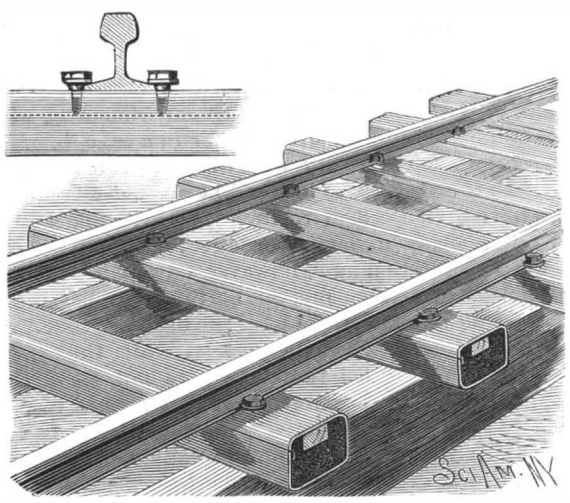
STANDARD PATTERN—16 INCH SWING ENGINE LATHE.

Gelatine Plaster Casts.

Some time ago Mr. C. W. Cathcart, M.B. (Edinburgh Infirmary), proposed a new basis for making casts of anatomical specimens. The basis is made as follows: Take of "No. 1" gelatine, say 6 oz., soak it till quite soft and swelled, afterward dry it slowly until just pliable. As it has now the minimum of water necessary, melt it in a water bath, and add 6 oz. (measure) of clear glycerine. When the two are thoroughly mixed, the material is ready. To render it opaque, add while it is still hot, and therefore fluid, small quantities of a thick paint made by rubbing up oxide of zinc in glycerine. When a skin color is wanted, a little vermilion is required to give a warm, life-like hue. Should other things be cast, the prevailing color can be given with water color as required (tubes of moist water color sold at 2d. each will be found convenient). Several pounds of this mixture may be made at once, and portions used as required.

AN IMPROVED METALLIC RAILWAY TIE.

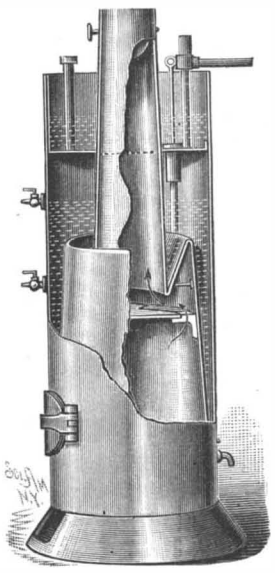
A metallic railway tie that is light in weight, while strong and elastic, is shown in the accompanying illustration, and has been patented by Mr. Samuel B. Jerome, of No. 16 Park Place, New York City. It is made of a sheet of metal, iron or steel, about one-sixteenth of an inch thick and of the proper length, bent or drawn by means of dies and tools to form a shell of the required shape, weighing about forty pounds, the edges being locked or riveted together. The interior of the shell is packed with shredded wood, commercially known as "excelsior," dried grass, sawdust, or other suitable material, closely packed, so as to be able to support the greatest weight and resist the utmost crushing force. On the under side of the upper surface of the shell is placed a strip of wood, opposite holes drilled through the metal to hold screw bolts or spikes, by which the rail is secured in position upon the tie, as shown in the small view. This tie will be slightly compressed under extreme load, but it is intended to be sufficiently elastic to return at once to its normal shape. It is especially designed for use on bridges, elevated railroads, and masonry structures, where it is calculated to relieve the roadbed, so far as possible, from the ordinary jar and hammering of the trains.



JEROME'S METALLIC RAILWAY TIE.

A BOILER FOR STEAMING AND COOKING FEED.

An inexpensive and efficient low pressure steam boiler for steaming and cooking feed is illustrated herewith, and has been patented by Mr. George W. Shealey, of Hiawatha, Kansas. In the lower part of the body of the boiler is fitted a firebox, in the form of a frustum of a hollow cone, its top having a funnel shaped crown sheet projecting downward into the firebox and connected with a tapering flue passing upward, a central deflecting plate, supported by brackets near the top of the firebox, throwing the heat laterally against the walls of the firebox. In the top of the boiler is a reservoir in which the feed water is heated, the reservoir being connected with the water space in the boiler by a pipe having a valve controlled by a rod extending above the boiler. Extending upward through this reservoir, from the steam space in the boiler on one side, is a pipe with a weighted cap, forming a safety valve, and on the other side is a pipe provided with a vacuum valve, with which is connected the pipe by which the steam is taken away for use. In the side of the boiler are try cocks for ascertaining the water level. It will be seen that this construction, from the thin body of water surrounding the firebox and its funnel shaped crown sheet, presents decided advantages for the rapid making of steam with great economy of fuel.



SHEALEY'S STEAM BOILER.

Aprosexie.

The name that serves as a title to this note was formed by Dr. Guye, a distinguished aurist of Amsterdam, and signifies want of attention, or inattentiveness. Although the name is recent, the thing itself is old, and quite well known in its effects. So Dr. Guye has occupied himself, not with its effects, but with its causes. It is a curious thing that the nose is one of the causes of aprosexie. This organ is decidedly in favor at this moment. It is not long ago that we saw the great role that it was made to play (sometimes rightly, but sometimes also wrongly), by virtue of exaggerated and hasty generalizations, in the production of certain dyspnœas. Now it is a question of its psychological influence.

Aprosexie, in the cases cited by Guye, appears to be due to a greater or less obstruction of the nasal fossæ, which forces the patient to breathe through the nose, thus giving the face an expression of little intelligence, as we all know.

The following are the cases reported by the Amsterdam scientist: The first is that of a young boy, unable to breathe through the nose, or to learn anything whatever. Guye extirpated the adenoid tumors from his nasal fossæ, and the child, in eight days, knew his entire alphabet, while at the date of the operation he knew but the three first letters of it. The second case concerns a man of twenty, who, from the age of eight, was troubled with buzzing in his ears, and was attacked with vertigo whenever he worked. After the same operation, mental labor became easy and profitable. The third case is that of a medical student, which presented analogous symptoms. The cure was effected by the same method.

How is the influence of these nasal troubles upon the cerebral functions to be explained? Dr. Guye supposes that they prevent the cerebral lymph from circulating freely, whence the origin of conditions unfavorable for the brain. It is by analogous troubles that certain headaches are explained, and it is by the same operation that Dr. Guye treats them. He believes in partial aprosexies referable to different studies, and he has observed one that was limited to mathematics.—*Revue Scientifique.*

WORK now in progress at the naval gun shops in the Washington Navy Yard employs nearly 400 men. Four 10 in. steel breech-loading rifled guns for the monitor Miantonomoh and ten 6 in. steel breech loading rifled guns for general service are under construction. There is also a large amount of work going on in the fitting up of tubes, hoops, etc., for other guns. In addition to the gun work there are in progress four turret mounts for the Miantonomoh's 10 in. guns and four central pivot carriages for 6 in. guns. In the foundry there are 1,000 cast iron shells for 6 in. guns. Work on a secondary battery for the Chicago has been discontinued for the present.

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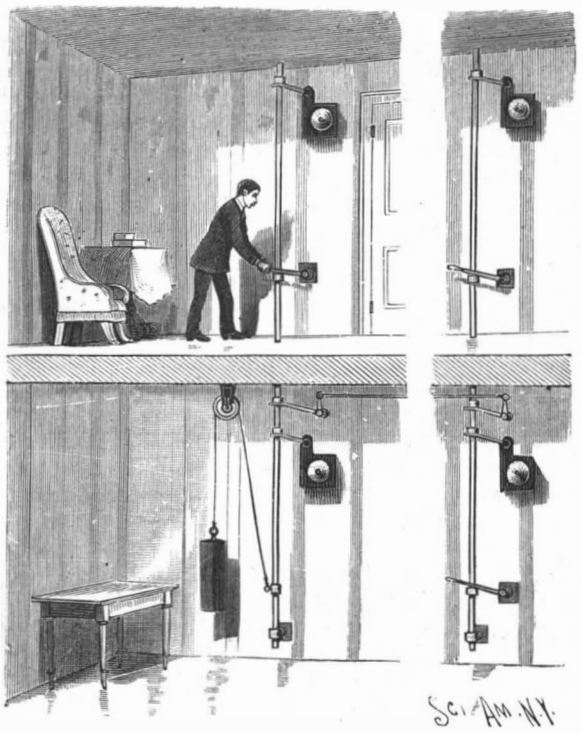
A FIRE ALARM FOR LARGE BUILDINGS.

A device whereby an alarm may be sounded from any room in large buildings, such as factories, schools, hotels, etc., and be immediately and automatically communicated to all the other rooms, has been patented by Mr. James West, of St. Louis, Mo., and is illustrated herewith. From each of the lowest rooms in the building a rod extends vertically through the floors into the highest rooms, parallel with a line of gongs at-

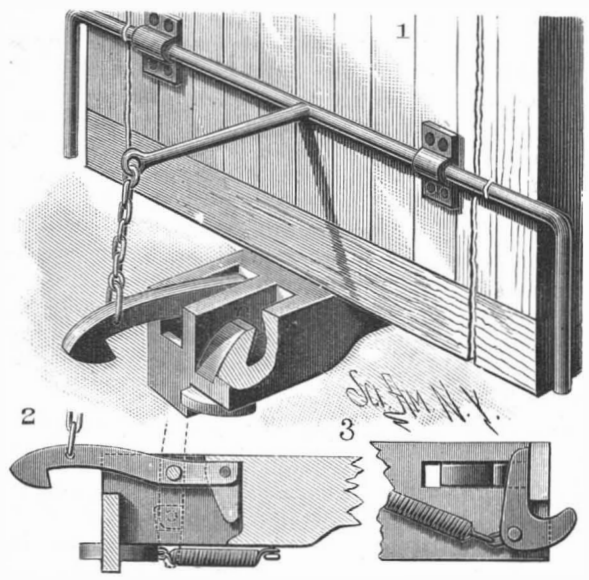


WEST'S FIRE ALARM.

tached to suitable supports in each room, the various rods being connected with each other and counterbalanced by one or more weights in one of the lower rooms. In each room two or more collars are fitted upon the vertical rods, one of the collars being adapted to engage a trip rod attached to the striking arm of a gong, the other collar being engaged by a hand lever, hinged or pivoted to a convenient bracket. The various rods are so connected that when one is reciprocated, the motion will be communicated to the others, and an alarm will be sounded in each room. An alarm of this character may also be used as a drill signal, whereby the occupants may be trained to act properly in case of fire, quickly locating the means of escape and preserving their presence of mind.

AN IMPROVED CAR COUPLING.

A car coupling which is designed to be automatic, and applicable to drawheads of the same or different



REED'S CAR COUPLING.

heights, has been patented by Mr. William M. Reed, of Shelton, Neb., and is illustrated herewith, Fig. 2 showing a vertical longitudinal section and Fig. 3 a plan view of the under side of the coupling. The forward end of the drawhead has two comparatively wide vertical slots, one extending entirely through, and having a front end wall for a portion of its height. A hooked coupling bar is pivoted in this slot, to the rear end of which is pivotally hung a dog, so jointed that it may either be in a line with the coupling bar, when the latter is held vertically, as shown in the dotted lines in Fig. 2, or swung at an angle thereto. A lever having two angular arms is pivoted to the under side of the drawhead, its forwardly extending arm projecting beyond the front, a spring holding the lever with one arm in its outermost position. Upon the end of the car, in suitable bearings, is a horizontal shaft, with crank handles at either side, by which, or by a chain extending to the top of the car, the coupling bar may be operated. Should the coupling bar be raised, an abutting car, striking the lever arm extending beyond the drawhead, causes the other lever arm to move the dog, and with it the coupling bar, to swing it down. The other slot in the forward end of the drawhead is arranged to automatically couple with an approaching hooked coupling bar, so that whether the drawbars are in their normal coupling positions or whether they are raised, on meeting another similar drawhead, a coupling will be effected.

Steam Jackets.

According to the *Revue Industrielle*, M. P. Guzzi, an Italian engineer, has recently introduced a system of constructing steam engines in which the jacket is supplied with steam of a higher pressure than that used inside the cylinder. The high pressure steam is generated by a small boiler constructed on Perkins' system, which is placed inside the furnace of the main boiler. In this way steam is obtained at a pressure of about 220 lb. per square inch, with a corresponding temperature of about 390 deg. Fahr., and with this steam the jackets are supplied, and when condensed in these it drains back into the boiler. By this arrangement the initial condensation in the cylinder is materially reduced, with a corresponding improvement in the efficiency of the motor, as the following figures, taken from an engine when working as described above, and when working under normal conditions, show :

	Jacket using Steam at a Pressure of 176 lb. per sq. in.	Jacket working under Normal Conditions.
Date of experiment	Feb. 24, 1886.	Feb. 20, 1886.
Duration of test	6 hrs. 18 min.	7 hrs. 11 min.
Mean effective pressure in main boiler	56·6 lb. per sq. in.	56·2 lb. per sq. in.
Mean indicated horse power	25·9	25·67
Consumption of water per indicated horse power per hour	19·6 lb.	23·5 lb.

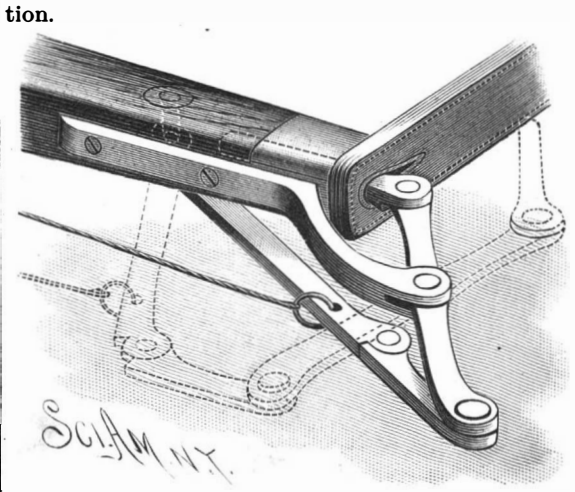
This engine has now been working for about eighteen months, but in other cases, to avoid the risk arising from high pressure steam, it has been proposed to substitute for the steam the vapor of linseed oil, which boils under atmospheric pressure at about 700 degrees Fahrenheit.

Incendiary Rats.

According to *Fire and Water*, Fire Marshal Whitcomb, of Boston, has been recently experimenting with rats and matches, shut up together in a cage, in order to ascertain whether they were likely to cause fires or not. In the absence of other known cause, frequent fires have been ascribed to their agency, while at the same time many underwriters affected to scoff at the idea. The question may, however, now be considered as settled. The very first night that Marshal Whitcomb's rats were left alone with the matches, four fires were caused, and not a day passed while the experiment was being tried that fires were not set in this way. The rats were well fed, but they seemed to find something in the phosphorus that they liked. It was noticed that only the phosphorus ends were gnawed, and in nearly every instance the matches were dragged away from the spot where they had been laid.

AN IMPROVED HORSE DETACHER.

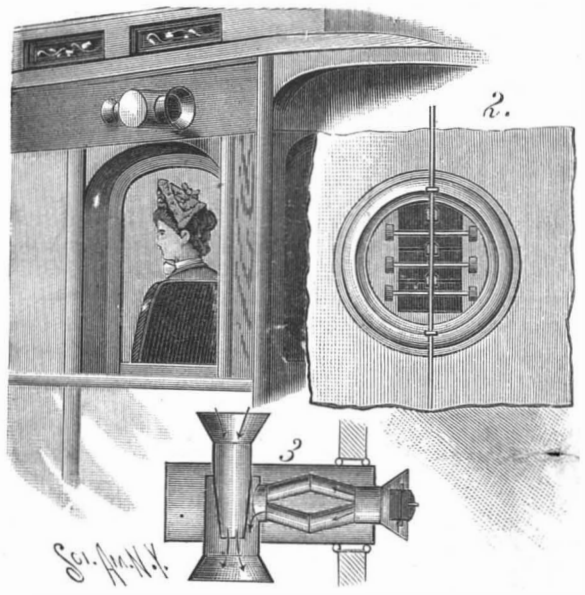
A device for detaching horses from vehicles, in which the parts cannot rattle, and with which great reliability of action is assured, is illustrated herewith, and has been patented by Mr. Thomas White, of Peekskill, N. Y. The whiffletree is provided with end sockets to receive the trace bolts, which are hinged to levers pivoted to rigid brackets on the whiffletree, the free end of each bolt-carrying lever being connected to the whiffletree by a knuckle-jointed rod. The rods on each end of the whiffletree are connected together by a cord or line, guided by pulleys on the inside of the whiffletree, and to the middle of this connecting cord is attached an operating cord, to be carried within easy reach of a person in the vehicle. By pulling on this operating cord, in case of a runaway, the knuckle-jointed rods are simultaneously folded at their joints, thereby retracting the bolts and releasing the traces, as shown in dotted lines in the illustration.



WHITE'S HORSE DETACHER.

AN IMPROVED VENTILATOR FOR RAILWAY CARS.

A ventilator of light construction, but extremely strong, to resist the heavy currents produced by the rapid motion of cars, has been patented by Mr. Frederick C. Werner, M.D., of Watertown, Wis., and is illustrated herewith, Fig. 3 being a sectional plan view and Fig. 2 showing the inner end of the ventilator. A collar is fitted in the side of the car in which is mounted to turn the inner end of a cylinder having caps on its inner and outer ends. The inner end of the ventilator has a slotted register, with regulating rod and keeper extending within convenient reach of an operator. Two small pipes lead toward the outer end of the ventilating cylinder, first diverging and then

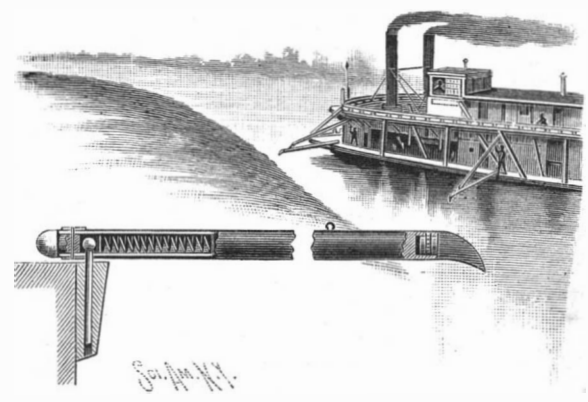


WERNER'S VENTILATOR.

converging at an angle, and open into the side of a large pipe, the outer end of which has a flaring mouth, the inner end having a collar receiving the tapering nozzle of a smaller pipe which has an outward flaring mouth. With this construction, the register being open, the air currents passing outward from the car, as indicated by the arrows, meet at an angle at the outer end of the small pipes, forming a fan-like stream, completely surrounding the tapering nozzle, through which air is passing according to the speed of the train, thus inducing a very strong draught through the ventilator.

A FENDER SPAR FOR VESSELS.

A spar for use on wharfs and different kinds of vessels, to obviate the severe jar at present consequent upon boats making a landing, or to hold the vessel in a given position, is illustrated herewith, and has been patented by Mr. William J. Rankins, of Augusta, Ky. The spar has a longitudinal bore at its inner end, in which is a coiled spring, above a longitudinal slot in the spar, there being a plate at the rear of the spring bearing against the head of a pin socketed in a bracket attached to the wharf or the gunwale of a boat. In a bore at the outer end of the spar the shank of a bifurcated head block, with claw-like points, is held to turn, the upper side of the spar having eyes, to which tackle



RANKINS' FENDER SPAR.

may be attached. By this device a boat may be held at a given distance off shore, and kept in place there for repairs or painting, or the device may be employed to ease the approach of a vessel to a dock.

Sodium Bicarbonate.

The genesis of the ammonia process for the manufacture of sodium bicarbonate is thus described by its originator, Mr. Thoms, in a letter to his son :

"My first experiment was made by taking a good pinch of the substances (bicarbonate of ammonia and common salt), placing them in my left hand, mixing them with the forefinger of the right hand, and allowing water to drop from the fingers of my right hand to wash with as little water as possible. The heat of my hand dried very soon the product, and I learned that the decomposition could be made, whether profitable or not." After the first "plant" was established for carrying out the new process, Mr. Thoms was employed to run it at a salary of £30 a year.

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Paper Bottles.

One of the most interesting of the many uses to which paper has been put is the manufacture of paper bottles.

We have long had paper boxes, barrels, and car wheels, and more recently paper pails, wash basins, and other vessels; but now comes a further evolution of paper in the shape of paper bottles, which are already quite extensively used for containing such substances as ink, bluing, shoe dressing, glue, etc., and they would seem to be equally well adapted for containing a large variety of articles.

They are made by rolling glued sheets of paper into long cylinders, which are then cut into suitable lengths, tops and bottoms are fitted in, the inside coated with a waterproof compound, and all this done by machinery almost as quickly as one can count.

They are cheaper and lighter than glass, unbreakable, and consequently very popular with consumers, while the fact that they require no packing material, and are clean, handy, and economical, commends them to manufacturers. Unlike glass, they can be manufactured and shipped at all seasons; and being made by machinery, the supply is independent of labor troubles, which are additional advantages to manufacturers who use bottles.

Suggestions of the Blizzard.

The recent blizzard with its accompanying high wind was somewhat alarming to dwellers in country frame houses. The speed of the wind is said to have been sixty miles an hour, and under such enormous pressure most houses quivered and shook. If such gales are in the future to come upon us in this locality, it is important that as far as possible our frame houses be so constructed as to stand up firmly against them.

A house is able to resist the pressure of the wind, mainly, because of its weight upon its foundation. Anything, therefore, that will add to its gravity or help to bind it to its foundation will so far increase its stability.

This may be done by "beam filling," not, as it is usually performed, merely with one row of bricks on the outside edge of the wall, to the top of the beams, but by building the *wall up solid* the full width thereof to the top of the beams. The first floor beams thus become firmly embedded and fastened to the foundation itself, and as it were a part of the same. Then, if to these the upright timbers are securely mortised and nailed, and all braced with scantling within the frame, and hemlock boards put on *diagonally* on the outside of the same, the whole framework will be so braced and substantial that it will effectually resist any gale likely to visit us in this section. More strength may still be added by continuing upward one course of brick, laid on the flat, between the studs, say six feet, or better still up to the second story. This last is the old fashioned way of building, when sheathing was omitted, and the outside covering only wide siding one inch thick and rabbeted. The bricks thus laid gave not only firmness to the houses, but also warmth in winter and coolness in summer. Until the time when our dwellings can be built of stone or brick (which at present are too costly), too much attention cannot be given to the construction of *frame* houses in the most substantial manner.

Butternut Wood for Indoor Work.

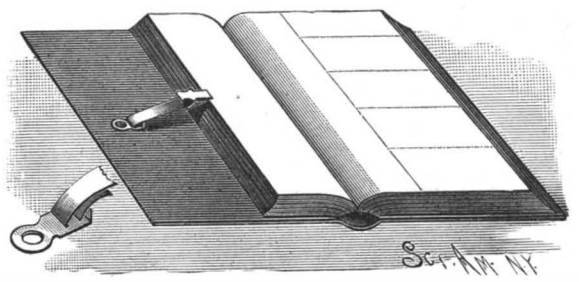
"Look here," said one of the best known lumber dealers to the editor of the *St. Louis Lumberman*. "Why don't you say a good word for butternut, which, of all the woods suitable for finishing purposes, is the most neglected right here in St. Louis? It has a splendid grain, is easily worked, and ought to increase in popularity. When my own house was built, I used cherry in the parlors and quartered oak in the dining room. Wishing to have a variety, I had the upper story rooms finished in butternut, and now many of my friends want to know why I didn't use it all over the house. Understand, I do not urge its use with the expectation of making a sale, for we haven't a foot of it in the yards. Our principal supply in this market comes from Wisconsin. It is growing scarce, and the only thing I have against butternut is that there is not enough of it."

Solid Petroleums.

According to the *Revue Scientifique*, Dr. Kaufmann has succeeded in solidifying petroleum by heating it for the space of half an hour with from one to three per cent of common soap, until the latter has quite dissolved in the petroleum, forming with it a homogeneous mass of the consistency of tallow. Cut up in cubes, this compound can be used as fuel for heating purposes. It does not ignite easily, but when once set on fire it burns steadily, slowly, and smokelessly, leaving a carbonaceous residue of about two per cent of its weight. Solid petroleum burns three times slower than coal, but yields a greater heat than the latter. American petroleum, according to Dr. Kaufmann's experiments, is more easily solidifiable than Russian. Previous experiments to solidify petroleum by boiling it up with common soap appear to have had no practical success.

IMPROVED STUB HOLDER FOR CHECK BOOKS, ETC.

A device to be applied to check and other books having sections designed to be torn out, whereby the stubs may be held down while the next page is being written upon, is illustrated herewith, and has been patented by Mr. Jasper M. Berry, Jr., of No. 225 St. Paul Street, Baltimore, Md. A hook or staple is either permanently or temporarily attached to the left hand cover, a band being attached to the hook or staple having on its outer end a clamp adapted to take hold of the stub.



BERRY'S STUB HOLDER FOR CHECK BOOKS, ETC.

The clamp may be of any desired form, and the band may be either rigid or flexible, different styles of clamp and band being provided for.

A Cheap Fireproof Stable.

A correspondent of the Hartford *Courant* relates what he saw in Frankfort, Germany. The loft of a stable had burned out, and he asked for the horses, thinking that they must all have perished, but he was assured that they were in the stable and all right, for no smoke nor heat could touch them.

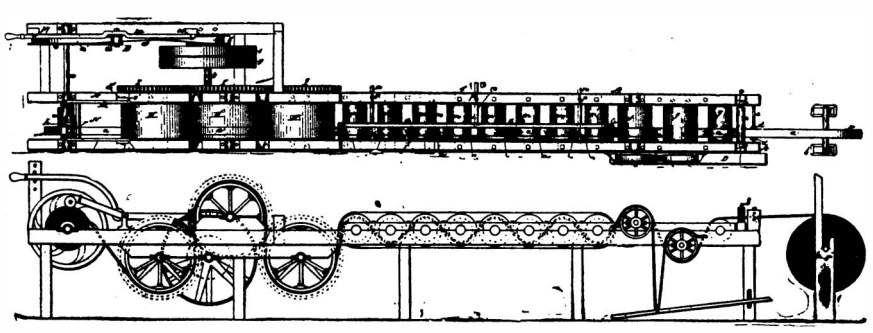
After everything was burned in the loft, he made an inspection, and found that the stable was practically fireproof. They had in its construction used old railroad ties, placing them three and a half to four feet apart, and then put arched corrugated iron between the ties, and filled in with a mixture of cinders and lime, making it deep enough to protect the ties.

The trap or door to reach the loft was made of sheet iron, filled in with the same compound. This kind of fireproofing is very cheap and, according to the writer, is very effective.

BELT STRETCHING AND TESTING MACHINE.

Most users of belting have experienced the trouble caused by a large amount of stretching in belts that takes place when the belts are new and first put into use. Various means have been resorted to in times past to remedy this trouble by special processes in the stretching of the leather before the leather was "made up" into belts, and by these means belts do not stretch at present as much as they did formerly.

It was not until very recently that methods were found by which belts, after being made, could be properly tested and a very large per cent of the stretch taken out, which, after all that has been done in the process of manufacture, still occurs after belts are put into use. We publish an illustration of a machine on which Geo. F. Page, president of the Page Belting Company, has recently secured a patent. This machine is to accomplish, after the belt is "made up" into rolls, the testing and the stretching which heretofore have been done after the belt has been sold and put into use, for by this machine a belt is subjected to the same experience that it receives in actual use. In this machine a roll of belting is shown in process of testing and stretching.



BELT STRETCHING AND TESTING MACHINE.

The great advantages afforded will be apparent to every user of belting. This machine is in use in the factory of the Page Belting Company, of Concord, N. H. In practice, the belt is run through the machine several times, first one end forward, then the other, so that it is as thoroughly tested and stretched as possible, and this work is done after the leather, having been cut into narrow pieces, has been thoroughly stretched twice in the manufacture before it is "made up" into belts.

Heinrich Anton de Bary.

On the 19th of January, Professor Heinrich Anton de Bary, the eminent botanist, of the University of Strassburg, died at the age of 57 years. De Bary was born in 1831 in Frankfurt-on-Main, his father being a physician of Belgian extraction. At the age of eighteen he went to Heidelberg to study medicine and from thence to Marburg; subsequently he went to Berlin, where he came under the influence of Alexander Braun, the botanist. After taking his degree, he became professor of botany successively at Freiburg, Halle, and Strassburg, holding the latter office from 1872 until his death. De Bary's first published work was on the morphology and biology of some forms of fungi, and although one of his most important works dealt with the comparative anatomy of the phanerogams and ferns, the greater portion of his labors may be said to have been devoted to the cryptogams. Upon the life history of these he let in a flood of light, and contributed greatly to promote the advance in biological studies that has been so marked a feature in connection with the science of botany in recent years. The cause of death appears to have been a cancerous affection of the mouth, which first became manifest during his attendance at the last meeting of the British Association in Manchester. Professor De Bary was a few months since elected an honorary member of the Pharmaceutical Society of Great Britain.

Magnesium.

The following experiments were made for the aluminum and magnesium manufactory in Bremen, at the mechanical experimental station in Charlottenburg. Tensile strength, limit of breaking, 23·2 kilos. per 1 qmm., specific resistance to compression 27·2 kilos. per 1 qmm., bending strength 17·4 kilos.

In comparison with other metals, the strength of magnesium is relatively very considerable. The breaking coefficient for tensile strain per square millimeter is:

		Specific Gravity.
Magnesium	23·2 kilos	1·75
Aluminum	20·5 "	2·67
Brass	12·5 "	7·8–9·5
Bronze	23·0 "	8–9
Rod iron	38·0 "	7·6–7·8
Delta metal, poured in sand	34–36 "	8·6
Delta metal, rolled hard	53·0 "	—

Since the rolling of magnesium does not offer the slightest difficulty, even in such complicated forms as T I U, or as angles, round or four-cornered rods, plates or sheets of 0·1 mm. thickness, and as pure magnesium is sufficiently resistant to atmospheric influences and can be polished and easily cleaned, it lends itself on account of its lightness and relative strength to the construction of apparatus, etc., required to be made of metal and also to be light, as, for instance, nautical, physical, and astronomical instruments. The working of magnesium requires heat. At a temperature of 450° C., it can be rolled, pressed, worked, and brought into complicated forms. Screws and threads can be made of magnesium, and these are considerably sharper and more exact than those from aluminum. Owing to its cheapness, magnesium can also be used in the manufacture of a variety of useful articles. Experiments in this direction are now being made.—*Jour. Soc. Chem. Industry.*

Waterproofing Process for Woolen Goods.

The following method is in use in Germany for waterproofing woolen goods: A solution is made of 100 parts of alum, 100 parts of glue, 5 parts of tannin, and 2 parts of soluble glass by dissolving alum in a moderate quantity of boiling water. The glue is steeped in cold water until it has absorbed twice its weight of water, and is then dissolved by heat. The tannin and soluble glass are well stirred into the solution of glue, to which the alum solution is then added, and the whole is stirred and allowed to cool. One kilo. of the gelatinous mass is boiled for three hours in 10 to 15 liters of water, fresh water being continually added to compensate for evaporation. The bath is then allowed to cool to 80 degrees Centigrade, and the material to be rendered waterproof is kept in it for half an hour, then withdrawn, and the moisture is allowed to drip from it for several hours. Finally the cloth is stretched on a frame and allowed to dry at a temperature of 50 degrees, then calendered. The cloth gains considerably in weight, and is perfectly waterproof, though it impedes neither air nor perspiration.

SOME one says that a remarkable imitation of black walnut may be manufactured from poor pine, the quality and appearance of the article being such as to defy detection, except upon very close examination. To accomplish this, one part of walnut peel extract is mixed with six parts of water, and with this solution the wood is coated. When the material is half dry, a solution of bichromate of potash, with water, is rubbed on it, and the made walnut is ready for use.

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THE YOUNG TAPIR IN THE ZOOLOGICAL GARDEN AT COLOGNE.

On Sunday morning, August 6, of last year, a tapir was born in the Zoological Garden at Cologne, and when I had time to examine it in its stall, I found it a most beautiful little animal. There was not that lack of proportion between its body and legs which is always so noticeable in the young of the deer and the antelope, its form resembling very closely that of the grown animals, although the colors of its coat were very different from theirs. Instead of the thin bristle-like covering of the old ones, through which the skin shows, it had a thick, velvety, shining black fur, from which the yellowish-white stripes and spots stood out beautifully. Along its spine ran a row of spots, and parallel with these, on the sides of the body, were many long stripes, one below the other, which terminated on the haunches in short oblique lines. Between these lines were more spots, which were so close together on the belly and on the legs, near the pretty little hoofs, that these parts of the body looked really speckled.

His prettily colored coat made the young tapir look very different from his parents, with their uniform, dark color, but on the other hand gave him so strong a resemblance to the young of the wild hog—which has the same marking on a light ground—as to furnish the careful observer with matter for thought, specially as science does not confirm the suggestion of a very close relationship between the tapir and the swine. The latest arrangement places them in two very different classes of mammals. In explanation of this apparent contradiction it should be said here that the present members of the two orders, which are distinguished by the formation of the feet, are only the remnants of the numerous groups of ungulate animals which existed in the earlier ages, and are uninterruptedly connected by the species which have died out. The habits of the tapir in the care of her young are the same as those of the sow, the young tapir sucking just as the little pig does, while the mother lies on her side. Our artist has given us a very natural representation of the young tapir with his parents.

Our young tapir thrives under the care of his strong, well-fed mother, and at a remarkably early age he gave proof of his independence. Before he was a week old he began to eat with the old ones, adopting their quiet, thoughtful manner—to the delight of the public—when tasting the bran or slowly chewing a little clover hay, as if trying it. As he grew there was a perceptible change in his appearance. In the fourth week his coat began to thin out, so that the skin showed through it here and there, and as the background became lighter the spots became quite indistinct, and then entirely disappeared. As nearly as I could tell, the change was caused by the light hair of the spots dropping out and dark hair taking its place. According to Renggar, the light marks will entirely disappear in the third year. I trust that we shall be able to test his assertion with our young tapir, and his well-rounded body and gay movements at twilight seem to give foundation for my hopes.—*Illustrirte Zeitung.*

THE YOUNG TAPIR IN THE ZOOLOGICAL GARDEN AT COLOGNE.

The "Great American Desert."

There is no more astounding proof of the growth of this republic, says the *Journal of Commerce*, than the fact that middle-aged men now living have seen the confines of this supposed desert shrink almost to nothingness. The desert has thus marvelously contracted, simply because it is not what we should call a desert, save in comparatively a few spots. The old theories about its sterility have all turned out wrong. It was supposed that, because for the most part treeless, it had no rainfall. Or, if a certain small quantity of rain was granted to it, then it was assumed that this was insufficient for farming purposes. Therefore, at its best estate, the "Great American Desert" could serve only as pasture ground for cattle and sheep, as originally it had served for millions of buffaloes.

Experience has proved this theory of a treeless waste and a rainless area to be all a mistake. There is a melancholy want of trees on the Western plains, but their absence does not entail a perpetual drought anywhere. And small though the annual precipitation of rain may be in some places, the pioneer has yet to find the spot (barring alkali lands and pure sand patches) where the heavens deny him water for the raising of grain and vegetables.

A writer in *Science* has set himself to answer the question, "Is the rainfall increasing upon the plains?" After a careful inspection of all the available data, he is of the opinion that there has been no increase of rainfall on the plains since they began to be settled up by farmers. They have planted many trees, it is true, but not enough to satisfy the theory which associates forests with moisture. The truth is, as the writer shows, that the prevalent ideas about the amount of rainfall necessary for farming operations were erroneous. As the pioneers have tested the capabilities of the soil in their western march, they have discovered that a rainfall of twenty inches a year is not the indispensable minimum. They can get along with ten, and it remains to be seen if even less will not answer. They have found that, however slight the rainfall may be, it can be greatly encouraged by cultivation. When the plains are plowed and harrowed, the rain sinks into the ground, and its evaporation is prevented by the crops whose roots it feeds. The improved conditions which Western people suppose to have been brought about by increased rainfall are merely due to the better conservation of the rain they get.

General Greely, the chief signal officer, has ably discussed this subject in a paper lately read before the Washington Philosophical Society. He declares that no part of the West can now positively be declared rainless. The area in which the rainfall has been popularly supposed to be less than fifteen inches has been reduced by a million of square miles since the census map of 1880 was prepared. Investigating the so-called "arid region," he discovers that the actual rainfall there is not less than sixteen inches, and in one locality thirty-seven. In refutation of the old notion that wheat could not be grown with less than twenty inches of rainfall, he cites statistics from Dakota showing that the grain was abundantly raised in the counties where the fall was between thirteen and fifteen inches only. These important results have been obtained from observations conducted at only one hundred stations in twelve States and Territories. As the number of posts is increased, our information on the subject will become more extensive and accurate. We doubt not that every year will assist in dispelling the illusion that any considerable tract of the ancient hypothetical desert is unavailable to the farmer.

Experiment on Sonorous Conductivity.

A number of rods of the size of a common lead pencil are prepared from rubber, cork, gutta percha, wood, glass, and steel, and, in order to facilitate the experiment, are united in threes by means of rubber bands, fragments of tubing of the same substance being interposed between them. To perform the experiment, place one end of the rods on a resonant box, and, holding them with one hand, touch their free ends in succession with the handle of a vibrating tuning fork. The sound is not audible when the rubber rod is touched, but becomes louder and louder when the entire series of rods is passed successively in review. By this method, the laws of sonorous conductivity are easily demonstrated, and it is shown that the intensity of sound remains constant, if we substitute one rod for another of the same substance, but of which the length and section vary in the same ratio. On varying the length only, we change the intensity, as we do also when we vary the section and leave the length constant. This method may be employed also for demonstrating the difference in conductivity of wood parallel with and perpendicular to the fibers, and even for determining the numeric ratio of these two conductivities.—*Jour. Russian Physico-Chem. Soc.*

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The New Railway Line from Eagle Pass to the City of Mexico.

The officials of the International Railway announce that the road was opened Thursday, March 1, for through passenger and freight business between the United States and this republic. It will be known as the "Sunset Route" to Mexico. This road was built by C. P. Huntington and associates, and is practically a branch of the great Southern Pacific system. It leaves the main line of the Southern Pacific at Eagle Pass, Texas, 168 miles west of San Antonio, and crosses the Rio Grande River to Piedras Negras, Mexico, from which point it traverses an interesting country, rich in minerals and agriculture, passing through the large coal deposits acquired by Mr. Huntington some years ago, and then on to Torreon, where connection is made with the Central. A contract has recently been made between the Central and International companies for an interchange of traffic, which permits the running of through cars between Piedras Negras and all points on the Mexican Central Railway, including the city of Mexico.

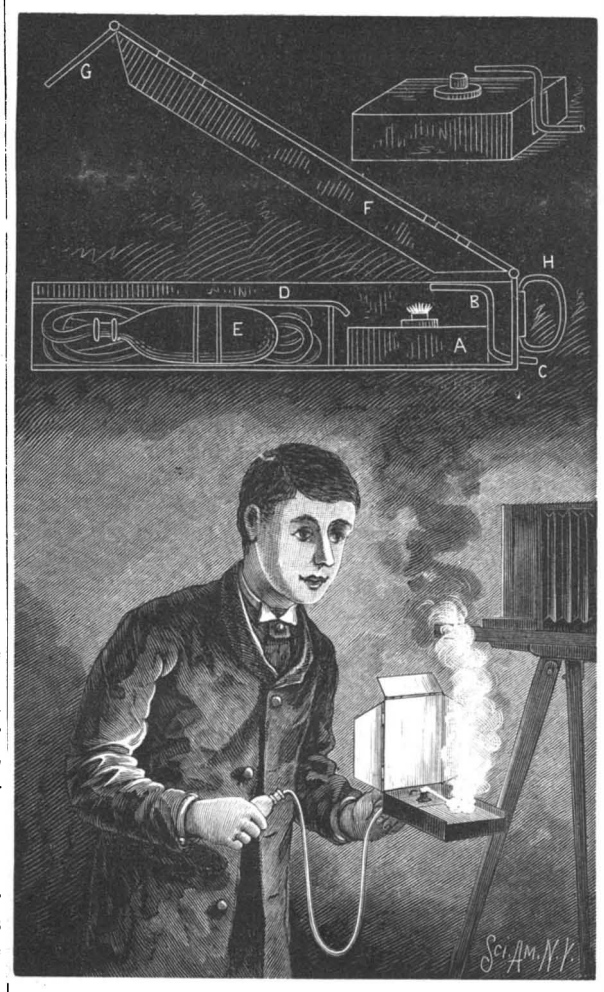
The new line is finely equipped, and has received a number of Pullman buffet sleepers, which are not surpassed for elegance on any road in America. These sleepers will run through between the city of Mexico and New Orleans, making but one change of cars to the city of Washington, St. Louis, Chicago, and other important cities. The completion of this road is hailed with pleasure here, as it reduces the distance to New Orleans, New York, and the Atlantic coast cities of the United States by 553 miles, and to St. Louis, Chicago, and cities in the Middle States about 400 miles, and shortens the time 24 hours. The freight and passenger rates have been greatly reduced, and it is expected that prompt freight service will be afforded without unnecessary delays.—*Mexican Financier.*

MAGNESIUM FLASH LAMPS.

Since the introduction of the magnesium powder flash light for photographic purposes, numerous devices have been invented for easily igniting the powder. We illustrate some of the latest forms.

The engraving herewith shows a lamp constructed to operate on the blow-through principle. A small tin box about six inches long, four inches wide by two inches deep, forms the foundation of the lamp. The box is provided with a cover, hinged at the back, having side wings, F, hinged to it, which fold under the cover when it is closed. It also has an end wing, G, which covers the end of the box. When opened and placed in a vertical position, the cover with the side wings turned out acts as a reflector of the light, and also as a protector, preventing the powder from flying back and burning the hand.

In the front part of the box is a horizontal sheet of metal, D, forming a platform on which the powder is placed. Directly behind it is an alcohol lamp, A, made quite flat, and low enough to allow the flame to project about an inch above the platform. Rising from



PNEUMATIC BLOW-THROUGH LAMP.

the bottom of the box, and projecting through the back, is a metal tube, B, tapered at its upper end like the jet for a lime light. It rises to a level with the igniting platform, and projects over the wick of the alcohol lamp. To the rear end of the tube, at C, is attached a rubber tube and a pneumatic bulb. A folding wire handle, H, is secured to the back of the box.

After placing the magnesium powder compound on the center of the igniting platform opposite the flame of alcohol, it is at once ignited by pressing the pneumatic bulb, since the horizontal stream of air emitted from the jet carries with it a certain portion of the alcohol flame. The moment the latter plays on the powder, a brilliant flash is produced.

The lamp may be held in the hand as shown or it may be placed on a stand or table, quite a distance from the operator.

The space under the igniting platform may be used for storing the bulb, E, rubber pipe, and powder when not in use, so that the whole when folded up will be compact enough to be carried in one's pocket. The general idea of this lamp is similar to one devised by Mr. Thos. McCollin, of Philadelphia, and lately exhibited before the Society of Amateur Photographers, of this city.

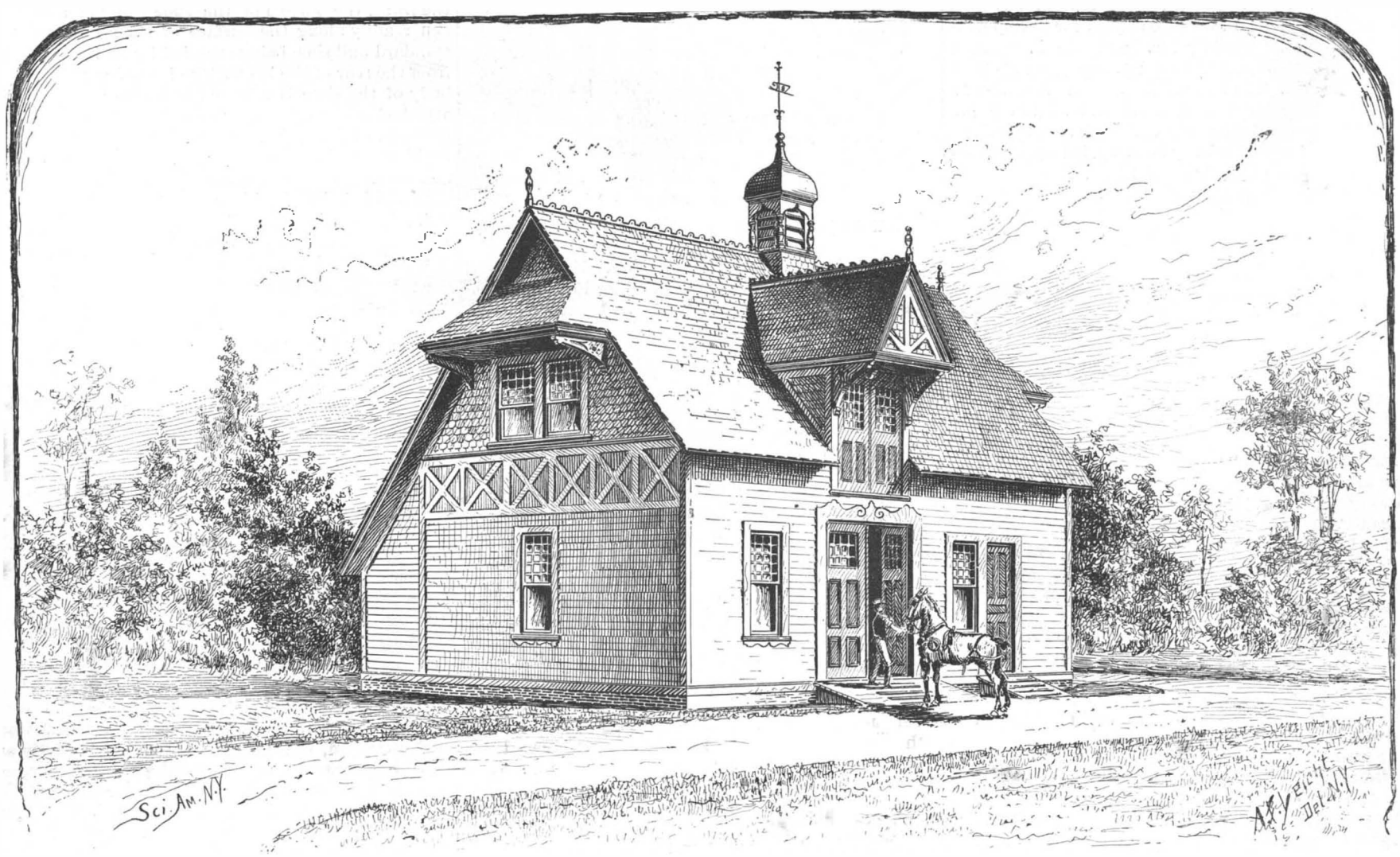
Fig. 1 represents a box similar to the one previously described, but the lamp is operated on a different principle. D is some loose cotton wicking, from four to six inches long, spread lengthwise on the igniting platform. E is a bottle of alcohol stored for convenience, together with the rubber bulb and tubing, when not in use, under the igniting platform.

The cotton, D, is saturated with a little alcohol. A is a vertical tube or cylinder, having a funnel-shaped top, and plugged with a cork. C is a tube rising from the bottom of A, and projecting over the igniting platform.

The tube, B, enters the rear of the box at the bottom, and connects with the top of tube, A. To operate the lamp, the rubber tube and bulb is attached at B, the cork removed from A, and into the latter is put the charge of plain magnesium powder. The cork is next tightly replaced. The wicking, D, is ignited with a match.

Compressing the pneumatic bulb will now force the powder in A through the tube, C, into the long alcohol flame and ignite it, producing as a result a brilliant flame. By means of a suitable reservoir, the cylinder, A, can be easily automatically refilled with magnesium powder, so that the latter can be successively forced into the flame at each pulsation of the bulb. The design shown is intended to supply a simple and easy means for igniting the powder. The box has a folding cover, and can be made of small dimensions.

Fig. 2 represents a plan for igniting small charges of magnesium powder with a Bunsen gas burner. The supply of gas enters through the tube, D. Located centrally within the burner, A, is a metal tube, B, which extends outward and is connected by tubing, C, to the bulb. Just below the top of the burner, at the end of tube, B, is fixed a metal funnel-shaped cup, E. The magnesium powder, on a small circular piece of paper, is set into the cup, E. The burner is then lighted, and pressure on the air bulb forces the paper



MR. BERGEN'S STABLE AT BABYLON, L. I.*

* In our last issue we presented a design of a handsome, inexpensive dwelling house, which had been erected at Worcester, Mass. As a companion to the dwelling house, we reproduce from the ARCHITECT AND BUILDERS EDITION of the SCIENTIFIC AMERICAN the elevation of a very pretty stable, which was designed by Mr. W. H. Beers, architect, of this city, for Mr. Jacob M. Bergen, who had one built after the plan at Babylon, L. I., in 1886. The December number of the SCIENTIFIC AMERICAN ARCHITECT AND BUILDER of that year contains the plan of the first and second stories of the stable, which are well arranged for the comfort of the horses, the housing of the carriages, and convenience of the coachman. A full specification accompanies the drawings, giving full details of the construction, from the foundation to the ventilated cupola on the top of the building.

Copies may be had at the office of this paper, and of most of the news agents. Price, 25 cents.

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and powder up from the cup, E, into the Bunsen flame, whence it is ignited with a flash.

The lamp shown in Fig. 2 operates on the same principle, but the central tube is connected by a metal tube, C, to the reservoir, A, holding a supply of magnesium powder. The gas enters at E, and the flame burns just above D. F is a reflector. The rubber pipe and bulb is attached at B. The hole for admitting the powder

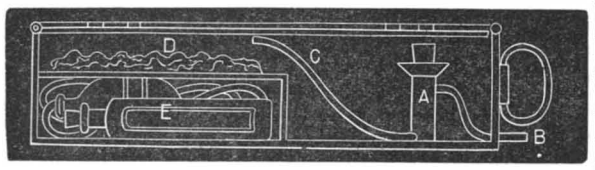


Fig. 1.

to this reservoir, A, is stopped with a cork. The gas may be kept burning all the time. As the air is forced into A, by compressing the bulb, a quantity of the powder is forced upward into the gas flame and ignited with a flash. It is only necessary to make successive compressions of the bulb to produce successive flashes, until the powder in the reservoir, A, is exhausted.

We have tried insect powder devices for forcing out the magnesium powder, but they do not prove effective unless the conical expelling tube is packed with the powder, that it may act as a piston, so that with a sudden compression of the bulb the whole of the powder will be ejected at one impulse.

If space is allowed for the air to pass by, the powder will

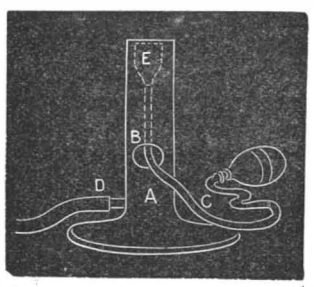


Fig. 2.

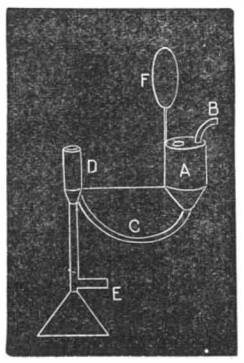


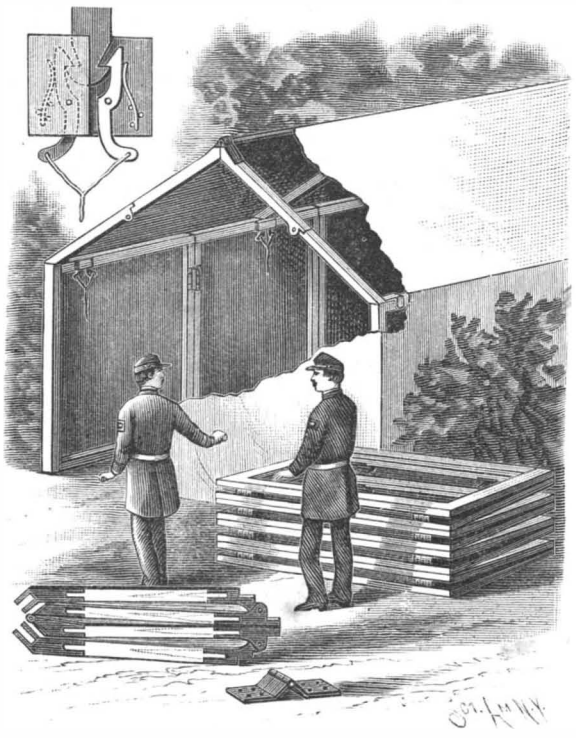
Fig. 3.

not be evenly discharged. The mouth of the jet in Fig. 1 should be about one-eighth of an inch in diameter.

It seems certain that the value of the flash light is now fully established as a means of obtaining photographs at night. Hence there is a field open to inventors for devising more effective devices, whereby the full power of the magnesium powder may be utilized.

AN IMPROVED FOLDING TENT OR LODGE.

An invention providing a folding tent or pavilion, which can be folded in small compass for transportation, has been patented by Mr. Laurence F. Ryan, of No. 172 East 112th Street, New York City, and is illustrated herewith. The body of the support is made of a series of rectangular frames, as shown folded in the illustration, the contiguous sides of the frames constituting the angles when the body is set up, being connected at top and bottom by a bracket hinge, the frames designed to be in alignment when the tent is set up having their contiguous sides united by a different form of hinge, and a locking device being provided for attach-

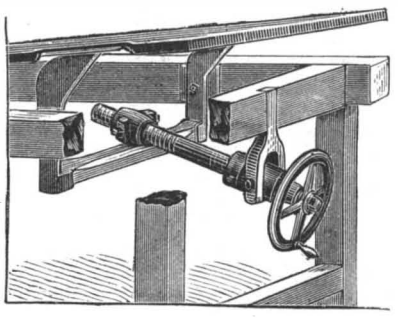


RYAN'S FOLDING TENT.

ment to the inner faces of the upper ends of the frames. The rafters are made to fold in sections, as shown, and when the tent is set up, are held in engagement by the locking device. A canvas covering is then thrown over the structure and made fast in any approved manner, making a tent or pavilion which is firm and commodious, and which may be quickly and easily struck, or set up with little labor.

FARWELL'S SAW TABLE ADJUSTER.

This adjuster, as shown in accompanying cut, consists of an arm each side of the frame, pivoted to an iron plate screwed to the frame. Connecting the arms at the bottom is a cross piece, in the center of which is an iron stand, for the reception of a pivoted nut, threaded to a screw extending to a bracket at front of frame, passing through a pivoted collar to a hand wheel, by

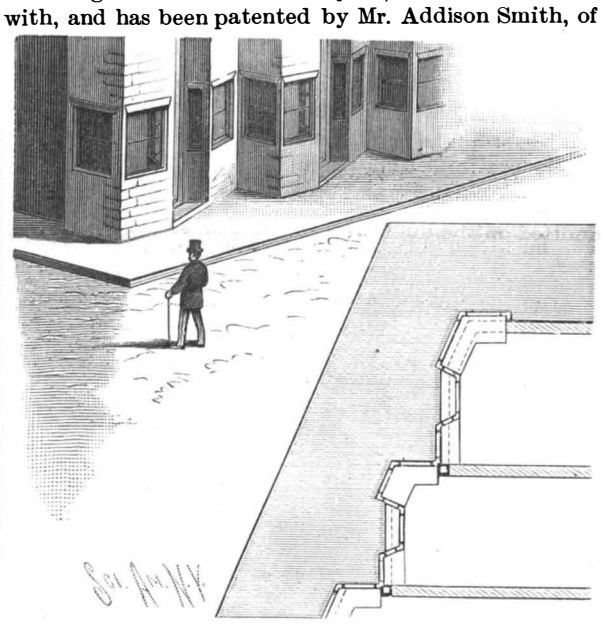


which the arms are raised and lowered alike, and at the same time securing a solid bearing for each corner of the bench top, by means of a grooved track, in which the arms work, thus preventing any side motion, and enabling the operator to adjust the top to any height required very quickly. The cross piece at bottom of arms is of wood, thus easily adjusted to any bench.

The Rollstone Machine Co., 48 Water Street, Fitchburg, Mass., the well known manufacturers of all kinds of wood working machinery, are the sole manufacturers, and will be pleased to furnish any additional information.

BUILDING FRONTS ON DIAGONAL STREETS.

An invention relating to the construction of buildings on the line of a diagonal street, providing a design according to which the front of one building will not interfere with the view of another, and the front entrance will be at right angles, while there will be advantageous show window space, is illustrated herewith, and has been patented by Mr. Addison Smith, of



SMITH'S IMPROVED CONSTRUCTION OF BUILDINGS.

the Elliott House, New Haven, Conn. Each side wall has a window reaching to the building line, and from such windows are built diagonal front windows on the building line, reaching nearly to a central door entrance. At the left of the doorway is built a window set somewhat back of the building line, and parallel with the doorway, as shown in the plan view.

The French Navy.

According to a recent report, the French navy consists of 386 vessels of all kinds, made up as follows: 18 first class ironclads, 19 armored cruisers, 1 ironclad floating battery, 9 battery cruisers, 9 first class cruisers, 11 second class cruisers, 15 third class cruisers, 15 first class dispatch boats, 31 second class dispatch boats, 16 dispatch boats also available as transports, 8 dispatch boats available as torpedo vessels, 16 unarmored gun boats, 12 launches, each carrying a gun, 11 steam launches, 10 sea-going torpedo boats, 62 first class torpedo boats, 41 second class torpedo boats, 7 vedette torpedo boats, 10 first class transports, 10 second class transports, 4 third class transports, 13 sailing ships, 29 ships used for fishery protection, and 3 training ships.

A WRITER in the *Sanitary News* suggests the following simple mode of thawing our water pipes:

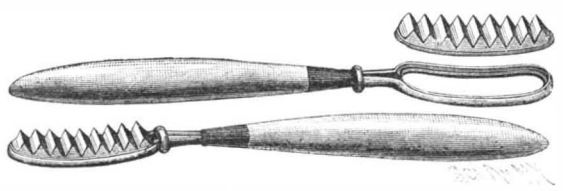
When I think there is a possibility that the pipes leading to the boiler might be frozen, as soon as I start the fire I pour a little alcohol into an old spoon and burn it under and along the hot water pipe from the stove to the boiler until it is warm. This loosens any ice that may have formed, and makes a vent that will prevent any explosion. If the cold water pipe was thawed instead, it might freeze up again before circulation started to keep it open.

A NOVELTY IN TOOTH BRUSHES.

It is obviously the intention of nature to supply every member of the human family with a good set of teeth. Strangely enough, the value of these very necessary organs is not appreciated by a large proportion of the people until decay is indicated by pain of the most uncomfortable sort. Then the sufferer resorts to the dentist, who perhaps succeeds in repairing the masticating apparatus so that it still serves its purpose. But a lesson has been learned, and it becomes a question as to preserving the teeth from further decay, thus avoiding pain, discomfort, and the dentist.

A tooth brush, tooth powders, and rubber bands or silk floss are the usual preventives of dental troubles. The utility of the first of these, in its common form, has been questioned by authorities in these matters. The bristles of tooth brushes are extremely harsh and unpleasant, producing unnecessary friction and wear upon the enamel, and inducing diseases of the gums. The bristles tooth brush has been used for so many years as to render it difficult to realize that anything better could be provided for the same purpose, still we here present a cut of a brush which, although of recent invention, has come into extensive use, and is favorably known wherever introduced. It is a tooth brush, or polisher, formed of felt and adapted to be used in connection with a suitable holder, as shown in the engraving.

This brush conforms to all the surfaces of the teeth,



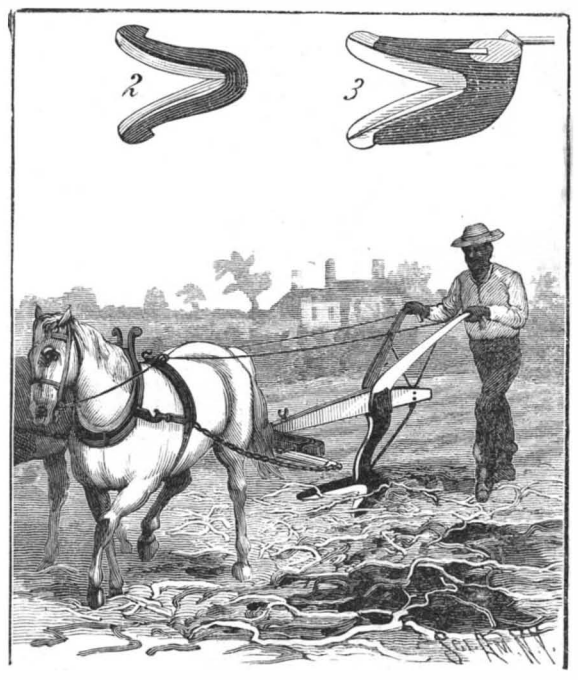
A NOVEL TOOTH BRUSH.

thoroughly cleansing and polishing them without undue friction, and without in any way injuring the gums. When one of the serrated felt tablets becomes worn, it may be instantly replaced by a new one at slight expense.

This novel article is being extensively manufactured by the Horsey Manufacturing Co., of Utica, N. Y.

AN IMPROVED GRUBBER.

A device specially adapted to remove from the surface of the ground the "saw palmetto," by cutting the roots which the stem sends out from its under surface into the ground, has been patented by Mr. Austin E. Lyman, and is represented herewith. To a beam similar to a plow beam is attached a standard having a bifurcated integral base or shoe, the opening being to the front, the bottom of the shoe being of a shape to run readily along the surface of the ground, and the standard and shoe being steadied by an inclined brace from the rear of the beam. The inner front edge of the body of the shoe is adapted to hold a knife or knives attached thereto, whereby an acute angle is formed at the back of the frame, as shown in Fig. 2, permitting nothing entering the open forward end of the carrier and traveling backward to escape uncut. A colter or vertical blade is affixed in the front edge of the standard, as shown in the sectional view, Fig. 3, to cut any transverse roots or vines that might come in the path of the shoe, and the grubber is made both right and left handed. By means of the handle the shoe may be



LYMAN'S GRUBBER.

given a motion from side to side as the team moves forward, rendering it easier for the team in working and facilitating the cutting of the roots.

For further particulars relating to this invention address Mr. John R. Lyman, Melbourne, Fla.

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Notes on Essential Oils.*

Anise oil is now almost wholly produced in Russia.

Camphor oil from Japan is coming into favor as a solvent for resins, paraffins, stearin, etc. In Japan it is coming into use as a solvent in lacquers. A favorite lacquer consists of camphor oil, 10 parts; oil of turpentine, 3½ parts; and copal resin, 8 parts. Paper treated with a solution of common resin in camphor oil becomes very transparent. A lacquer for metals is made by mixing camphor oil, 22 parts, with melted asphalt, 5 parts. Paper may be rendered water proof by treating with a mixture of camphor oil and linseed oil.

Cananga oil, designated as Indian, imported from Java, is supposed to be derived from the same plant as that which furnishes the ylang-ylang oil of the Philippines, but it is sold at a much lower price, and is very inferior in odor.

Cedar wood oil, used largely in Germany as a basis for soap perfume, is obtained chiefly from the waste of the lead pencil industry.

Eucalyptus oil, from E. globulus, is now produced in California in large quantities as a by-product in the manufacture of a preparation to prevent incrustations in steam boilers. Algeria also competes with Australia in the production of this oil, and is able to supply all present demands. The manufacture of the oil in Australia is, however, increasing, and a plant is about to be established also in Tasmania for distilling it. The statement made in a former report that the oil of E. amygdalina contains no eucalyptol is reaffirmed. The product sold as eucalyptol derived from the last named species differs *in toto* from true eucalyptol. The former consists of a mixture of terpin (eucalypten, $C_{10}H_{16}$) with a little cymol, and is distinguished at once by its low specific gravity, 0·886 at 15 deg. C., the genuine article having a sp. gr. of 0·930.

Turkish geranium oil (Palmarosa oil), more properly called Andropogon oil, is said to be submitted to a special treatment to render it suitable for use in adulterating oil of rose. It is bleached in the sun and rectified several times over rose leaves.

Hop oil, distilled from Bavarian hops, has now displaced that prepared from lupulin, which it excels in richness and delicacy of odor, due to the absence of butyric and valerianic acids. It is a mistaken notion that this oil has narcotic properties.

Marjoram oil from Spain, recently introduced into commerce, differs essentially from the oil distilled from German marjoram. It is recognized by its freedom from color.

Pepper oil, used extensively in fortifying spices, is obtained as a by-product in the manufacture of piperonal (heliotropin).

Rose oil and rose water have been recently produced in limited quantities experimentally in Germany, near Leipsic. It is said that there are now under cultivation for this purpose 15 acres of land, and the results have been quite satisfactory. The German oil is superior to any imported. It congeals at 20° (68° F.), showing the presence of a larger proportion of the fragrant stearoptene than is contained in the best Turkish oil.

Betel leaves yield an essential oil (0·5 per cent) of a brown color, an agreeable, tea-like odor, and a burning taste. Its specific gravity is 1·020 at 15° C. It boils at

Fig. 1.—EXPERIMENT ON CENTRIFUGAL FORCE.

250° to 260° C., and consists of a phenol agreeing in properties and reactions with eugenol and an indifferent hydrocarbon. The leaves are used in India in catarrhal and pulmonary affections, and it is probable that they owe whatever therapeutic virtue they have to the essential oil.

Musk seed yields a volatile oil which is likely to be of value in perfumery as a substitute for civet or musk. Its specific gravity at 25° C. is 0·900. It solidifies at a temperature below 10° C., and contains a free fatty acid, probably palmitic, which separates partially even at common temperatures.

Thymol is contained in abundance in the volatile oil of Monarda punctata, the American horsemint, which may hereafter become an important commercial source of this substance. The use of thymol as an antiseptic in dentifrices, etc., and as a general disinfectant, is rapidly increasing.

* From the October report of Messrs. Schimmel & Co., of Leipsic. —*Pharm. Era.*

SCIENTIFIC AMUSEMENTS.

The experiments herewith illustrated are selected by *La Nature* from a new edition of Mr. Gaston Tissandier's *Recreations Scientifiques.*

Fig. 1 shows the method of making a sling with a cane and a potato. The end of the cane is inserted in a potato in such a way that the latter shall have a certain degree of adhesion and be pretty firmly fixed. This done, the cane is swung around after the manner of a sling, and, being abruptly arrested at the moment when the end points toward the sky, the potato is thrown to a great height in the air.

Fig. 3.—DESSERT EXPERIMENT.

Fig. 2 shows the well known "sucker" of school boys. This object, as well known, consists of a leather disk through the center of which passes a strong cord, knotted on the under side of the disk to prevent its escape. After the disk has been soaked in water, if it be pressed against the sidewalk with the foot, and the cord be pulled, it acts on the principle of a cupping glass, and it is very difficult to separate it from the stone to which it adheres.

Fig. 3 shows a method of performing a neat dessert experiment. When a grape or raisin is allowed to fall to the bottom of a glass of champagne, bubbles of gas are observed to attach themselves to it. This causes it to rise to the surface, where the bubbles burst. Then it sinks, and afterward begins its ascent again. The bubbles of carbonic acid gas perform the role of minute balloons ascending in the liquid.

Patents as Investments.

It has been said that the introduction of useful inventions seems to hold by far the most excellent place among human actions. Unfortunately this, like many other truths, is not sufficient of itself to incite the inventive faculty. In these money-getting times mere sentiment succumbs to pecuniary gain, and when the value of an invention is called into question, it is not its moral or beneficial effect upon the community that is considered, but rather the more practical one of its influence upon the pocket. Do patents pay? is a question often put, and frequently answered in the negative, but erroneously so. For the amount of money invested, there are few properties that have paid more handsomely. Take the leading investments of the day, how many of them are gigantic failures? Of course all patents do not pay, neither do all investments in any description of property; but in these days of wild speculation, railroad bubbles, and bank failures, it may be very opportunely asked whether thirty-five dollars, or a little over two dollars a year, paid to the government for a seventeen years' exclusive right in and to some useful invention, is not a promising investment? It at least is not a very extravagant one.

We all know of patents that have paid their millions, but we do not all know of the many thousands upon thousands of patents which have realized for their owners amounts varying from five thousand to fifty thousand dollars and upward. Contrast these realizations and the paltry outlay required with other investments, and where is the property which yields as large a return? That many patents do not pay is not always the fault of the invention, but not unfrequently is due to the want of proper commercial management, or to the clumsy form in which the invention, perhaps a very meritorious one, has been ushered to the public. But even these patents ultimately sometimes prove valuable, on account of the principle involved or some one particular construction or combination they cover, so that holders of subsequent patents are compelled to pay tribute, and it is never safe to consider a patent worthless because it is dormant. Its day, after the lapse of years even, may come unexpectedly.

Again, inventors frequently are at fault in not following up their inventions by fortifying the original patent with subsequent ones covering improvements in matters of detail. Nor should repeated failure discourage an inventor; for if only one patent out of every ten pays, it will many times more than compensate for the cost of the ten. Not merely scientific men and mechanics, but men of leisure, will do well, then, to consider whether a patent, if only as a speculation, is not a cheap investment, even if the weightier consideration of advancing the cause of science or adding to human comfort, by ever so small a step, be altogether discarded.

Flour Dust Dangerous.

The *Milling World* reminds millers of the oft-proved fact that flour dust is a dangerously explosive material. Beware, says the editor, of lights thrust or carried into bins or rooms filled with dust-laden air. A week ago, he adds, I was startled as well as amused, on entering a friend's mill, to see the latest "cub" going around with an uncovered light, doing some investigation on "his own hook." As he thrust the light into a very dusty place, which his boyish curiosity suggested to him to explore, he was whistling in that peculiar foghorn tone peculiar to and possible to nobody but a half-grown boy, the popular old tune "I want to be an angel!" As his whistle rose keen and triumphant above the whirr and rattle of the mill machines, I almost expected to witness the answering of his whistled prayer by an explosion of dust that would at once convert him into the angel he professed to wish to be. Having put the foreman on his track, I felt safer to stay inside that building until my business was transacted. In how many cases is the wild, fresh, careless, untutored "cub" the real cause of "mysterious" fires and explosions? He is often as dangerous as a dynamite bomb or a fire brand.

New Remedy for Seasickness.

Prof. Watson Smith announces that in the new artificial alkaloid, antipyrine, discovered in 1883, by Knorr, of Erlangen, a potent remedy for seasickness has been found. The source of this antipyrine is that also of the aniline colors—viz., aniline—and thus, strange to say, this medicament is manufactured in the works of a large German firm producing alkalies, acids, and coal tar colors. Antipyrine may then be considered as a coal tar product. According to the *Compt. Rend.*, 1887, 105, 947, E. Dupuy administered antipyrine during the last three days before embarking and the first three days of an ocean voyage, in doses of 3 grammes per day. He states that none of the persons thus treated suffered from seasickness during the voyage across the Atlantic Ocean—a sufficiently severe test, certainly. Again, another and independent authority, M. Ossian-Bonnet (*Compt. Rend.*, 1887, 105, 1,028), states that antipyrine acts excellently as a remedy against seasickness. In most cases a dose of 1½ grammes is sufficient, the effect being manifested in about ten minutes. In other cases the dose must be repeated. M. Ossian-Bonnet never required to use more than 3 grammes, in two doses, in order to completely remove the evil within an hour. In some cases, which were very rare, when the sick person, in consequence of continued vomiting, could not take the remedy, a subcutaneous injection of one gramme of antipyrine proved sufficient to remove the seasickness.

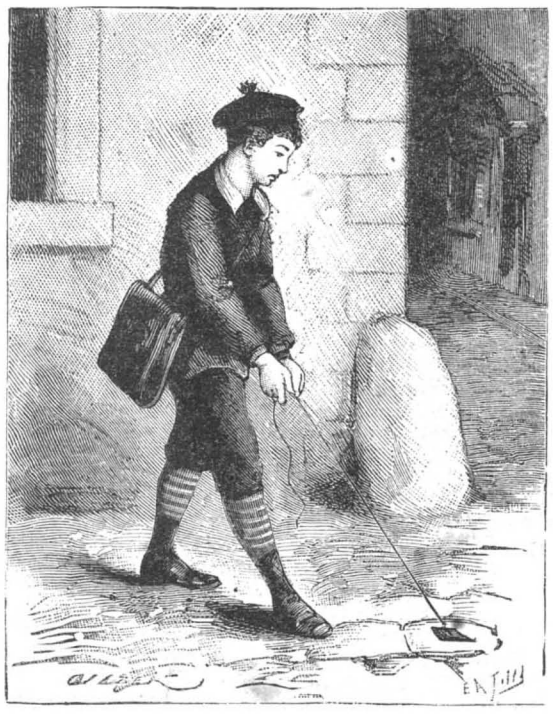

Fig. 2.—EXPERIMENT ON ATMOSPHERIC PRESSURE.

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ENGINEERING INVENTIONS.

A rotary engine has been patented by Messrs. Willis J. Fisk and Homer L. Phelps, of Lockwood, N. Y. Combined with a cylinder having a transverse valve chest, with supply and exhaust ports and reversing valve, is a piston body with a transverse mortise and sliding sectional abutment, each outer section of which is expanded longitudinally by the pressure of steam in the joints between the two parts, the invention also covering various other novel features.

A gas engine has been patented by Mr. I. Newton Hopkins, of Brooklyn, N. Y. Combined with a cylinder and hollow piston is a perforated disk near the ports, serving as a diaphragm for preventing the mixture of the products of combustion and gases drawn in during the forward stroke of the piston, and also as an abutment for the explosion. Another feature consists of an air supply pipe having two similar branches extending in opposite directions from the air port, their ends arranged opposite each other and a short distance apart, the object being to prevent noise at the air inlet.

AGRICULTURAL INVENTION.

A grain binder has been patented by Mr. William M. Clark, of Boscobel, Wis. This invention relates to certain new and useful improvements in twine grain binders, simplifying their construction and making the machine compact and the operation more simple, the invention consisting in the construction and combination of numerous parts and details.

MISCELLANEOUS INVENTIONS.

A hat and coat rack has been patented by Mr. Frank Clemens, of Lafayette, Ind. It is formed of a single wire bent in a novel form, with eyes and arms, and portions to bear against the wall or support, making a neat, strong, and cheap rack for hats and coats.

A sash weight has been patented by Mr. Milton L. Lissberger, of New York City. The lead body of the weight has a beveled recess, in which a shank with an eye and a pointed hook on its lower end can be inserted and made fast by driving a wedge into the recess back of the shank.

A band cutter and feeder for thrashing machines has been patented by Mr. Karl G. Bareis, of McFarland, Wis. It is for cutting the bands of sheaves and feeding the loose grain to the thrashing cylinder, the invention covering various novel parts and details and combinations thereof.

A street curb has been patented by Mr. Abraham B. Koplin, of Hellertown, Pa. It is made of metal curb sections having an inner top flange and angular pockets or recesses along its inner margin, with an outer downwardly projecting gutter flange, making a curb of great strength, adapted for all climates.

A door securer has been patented by Mr. Frank T. Cladek, of Rahway, N. J. Combined with a pivoted latch is a pivoted cam lever arranged to act upon the door for closing it tightly after the latch has engaged with the keeper upon the door frame, the device being designed more particularly for refrigerator doors.

A button has been patented by Mr. Adolph Blumenkrohn, of New York City. It consists of a blank upon which there is placed a machine-embroidered inner cover partially surrounded by an outer knit or crocheted cover formed with a central opening, through which the ornamental work upon the inner cover is seen.

An antidote for venomous bites has been patented by Mr. Joshua T. Smith, of Coffee County, Ga. It is a medical compound designed to act as a powerful arterial stimulant, which in practice is said to have been found especially useful in the treatment of rattlesnake bites, to be administered in doses of a wineglass every hour until the pain ceases.

A channel cutter for water ways has been patented by Mr. William H. Avey, of Columbus, Ky. It consists of barges timbered together and carrying opposite edgewise disposed boards or cutters capable of vertical adjustment, in connection with other novel combinations of parts and features of construction.

An umbrella has been patented by Mr. Edmund Q. Ison, of Long Island City, N. Y. The handle has a sleeve adapted to revolve thereon, whereby the umbrella is made capable of revolving upon its stick, thus breaking the force of the wind, and an improved catch is provided for retaining the umbrella in open position.

A clothes horse has been patented by Mr. Martin F. Dolan, of Brooklyn, N. Y. It consists of a tubular standard with a slotted or open top, and arms having locking parts, with other novel features, making a device capable of sustaining a large amount of line, and which when folded will occupy small room, and readily stand beneath a mantel or shelf.

Combination spectacles form the subject of a patent issued to Mr. Bernard Krause, of O'Fallon Depot, Ill. The invention consists of detachably connected spectacles, the focuses of the two sets converging exactly, the arrangement being such that the lenses usually employed for distances may be corrected by the other set to form reading spectacles.

An insulator has been patented by Mr. Lewis M. Neal, of North Middletown, Ky. It is formed of a solid piece of glass or other insulating material, with a post for receiving the telegraph wire, a channel around the post to increase the efficiency of the insulator, and a transverse aperture for receiving the wire by which the insulator is fastened to its support.

A propeller shaft bearing has been patented by Mr. John Richardson, of St. Mary's, Ga. The shaft is lengthened beyond the rear end of the hub of the screw, a bearing being secured to the stern post of the vessel and one to the rudder post, each having oil holes and upwardly extending pipes connected therewith, to the upper end of which oil cups are secured.

A candlestick has been patented by Mr. Hiram E. Lewis, of Gold Hill, Nevada. The candle-receiving tube has a spring for actuating the candle, and there is a lever pivotally connected with the tube, with other novel features, making an automatic feed for candlesticks and lanterns, to feed the candle upward as it burns down, so it may be entirely burned.

A photographic camera has been patented by Mr. Francis H. Patterson, of Norristown, Pa. The invention relates to cameras having swinging or reversible backs, and provides novel means for the adjustment of the lens end of the camera in rising and falling and rotatable directions, with special means for speedily releasing and securely holding it in position.

A mechanical movement has been patented by Mr. Benjamin F. Andrews, of Myers, Mo. It is designed to produce a high rate of speed in a rotary shaft from a slowly moving oscillating lever of greater power, within a limited space, the device being applicable for propelling vessels or vehicles and to various machines.

A pruning implement has been patented by Mr. Andreas Bosch, of Prairie du Chien, Wis. The invention covers a novel combination of parts in an implement for use in pruning trees and dressing their wounds, adapted for use on large and small limbs, and so arranged that it may be used upon trees of almost any height.

A vehicle spring has been patented by Mr. Edwin Jarrell, of Harper, Kansas. An important feature of this invention consists in torsional spring bars united or connected together at their inner ends and diverging from the point of connection, being suitably connected at their outer ends to enable their tension to properly operate.

An earth auger has been patented by Mr. Thomas Tow, of Miles City, Montana Ter. It consists of a novel form of spiral blade mounted on a rod to give great length of cutting edge, making an auger which can be easily and quickly forced down into the earth and at the same time will take hold of the earth to lift it.

A machine for regulating timepieces has been patented by Mr. William B. Farrar, of Greensborough, N. C. A galvanic battery and a regulating clock are mounted on a movable stand holding the watch to be regulated, and a magnet and battery circuit are used in combination with other mechanism to automatically adjust the regulator of the watch in accordance with the regulating clock.

A holder for advertising mediums has been patented by Mr. Philip Delano, of Brooklyn, N. Y. It consists of a rear bar adapted to be secured to a window casing, and provided with fastening pins for supporting the advertisement, clamping bars hinged to the rear ends of the bar being adapted to be locked together at their inner ends on the middle and in front of the rear bar.

An electric gas lighter and extinguisher has been patented by Mr. George L. Hogan, of Olmstead, Ky. The burner is provided with a poppet valve operated by a shaft and eccentric receiving rotary motion from the armature of an electro-magnet, with other novel features, the device being adapted for lighting a single lamp or a series of lamps at the same instant, and for street or office lighting.

A device for discharging coke ovens has been patented by Messrs. William T. Giles and William Booth, of Shamokin, Pa. It consists of a truck adapted to receive and hold the coal while in the oven, and a plow arranged outside of the oven, under which the truck is to be drawn to discharge its load, in combination with tracks and a windlass, being designed to save time and heat.

Facing brick for building purposes forms the subject of a patent issued to Messrs. Richard and Charles Steinau, of Brunswick, Germany. They consist of particular forms of angular bricks, to be laid in alternate reversed courses, the courses and the bedding joints of the facing bricks being laid opposite the middle of each bedding joint and course of the brick wall.

An automatic grain measure has been patented by Mr. Harry W. Cowan, of Gros, Dakota Ter. It has a box in which the grain is measured, and a vibratory measuring plate operating on the grain filling into the box for actuating tripping devices connected with the tilting bottom of the box, with other novel features, being adapted to accurately measure any kind of grain.

An animal trap has been patented by Messrs. La Fayette W. Page and Samuel Hardeman, of Franklin, Tenn. Combined with a striker connected with a rotary disk is a stop shoulder having eccentric approach and spring-actuated detent, the casing having circular top and bottom plates, with pivoted bait lever, and other novel features, whereby a large number of rats, etc., may be killed at one setting.

A sleeve button has been patented by Mr. Louis D. Frenot, of Newark, N. J. It has a threaded post surrounded by a sleeve, a nut engaging the post and sliding within the sleeve, with wings connected by hinge joints and to the sleeve, whereby the shank of the button may be passed through the button hole without subjecting the shank or the body of the button to excessive strain.

A watch case pendant has been patented by Mr. Peter Henry, of New York City. It consists of a bar with a winding shank at each end, the shanks being of unequal lengths, and the bar being adapted to be reversed in the rotating stem or holder, making a key for stem-winding watches which may be used with equal facility with "stem set" or "lever set" movements.

A holder for kegs, barrels, etc., has been patented by Mr. Cary A. Manker, of Louisville, Neb. It consists of a rope passing over a pulley held on the under side of a counter or other support, two clamps being connected with the rope, one engaging the bottom rim and the other the head of a barrel or keg, being especially adapted to facilitate work in retail stores.

A bridle has been patented by Messrs. Edwin Crippen and William King, of New Orleans, La. To each check strap is secured a snap hook to receive large bit rings, and below the snap hook is secured to the cheek pieces snap hooks designed to receive small bit rings, the large or small bit rings to be used as desired, the arrangement being designed to do away with the necessity for curb, chain, and other harsh bits.

A buckle has been patented by the same inventors, in which the loop or shackle is attached to the main frame by a bolt, so that the buckle may be removed from or applied to a strap or web without ripping or stitching it, the tongue being pivoted upon the bolt, and there being an integral loop for holding the end of a strap.

A heating stove has been patented by Mr. Charles H. L. Schlapp, of Davenport, Iowa. The fire pot is continued at one side into a magazine, which is inclosed by a combustion chamber that extends over the top of the fire pot, the latter connecting at its upper end with a mixing chamber, into which opens at each end a branch pipe leading to the base of the stove near the grate bars, the upper end of the fire pot having apertures for admitting air from the base, the stove being especially adapted for the complete and economical combustion of bituminous fuel.

A combined table and sofa forms the subject of two patents issued to Mr. John E. Alden, of Lake George, N. Y. They provide a design for an inexpensive and self-contained structure which may be easily and quickly set up to serve either of its intended purposes, and be strong and serviceable, the inventions covering various novel features of construction and combinations of parts, including simple and effective means for locking hinged end parts of a table top in unfolded positions to serve as legs to a sofa, when the table, with its legs folded within its frame, is inverted to receive the adjustable sofa top.

SCIENTIFIC AMERICAN
BUILDING EDITION.

MARCH NUMBER.—(No. 29.)

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2. Plate in colors of a handsome suburban residence, costing about Twelve Thousand Five Hundred Dollars, with floor plans, specifications, sheet of details, etc.
3. Elevations and floor plans of two dwellings of moderate cost.
4. Perspective view and floor plans of a house for Six Thousand Dollars.
5. Floor plans and elevations of a substantial residence at Tuxedo Park.—James Brown Lord, architect.
6. Perspective and two plans of a Cape Cod cottage of moderate cost.
7. Plans and perspective of a double house, costing about Six Thousand Five Hundred Dollars.
8. Elevation and plans of an alteration of a dwelling on Long Island.
9. Sketch of a one story residence erected at Birmingham, Ala., at a cost of Four Thousand Five Hundred Dollars.
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11. Plans of an English country house.
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13. Illustration of a house costing Three Thousand Dollars.
14. Designs of two substantial churches, costing about Four Thousand Dollars each.
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16. Sketch of the hall and stairway of a luxurious English dwelling.
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The *Railroad Gazette*, handsomely illustrated, published weekly, at 73 Broadway, New York. Specimen copies free. Send for catalogue of railroad books.

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The Knowles Steam Pump Works, 113 Federal St., Boston, and 93 Liberty St., New York, have just issued a new catalogue, in which are many new and improved forms of Pumping Machinery of the single and duplex, steam and power type. This catalogue will be mailed free of charge on application.

Link Belting and Wheels. Link Belt M. Co., Chicago.

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Reports on the value and validity of patents for investors. Benjamin's Scientific Expert Office, No. 35 Wall Street, New York.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

The Holly Manufacturing Co., of Lockport, N. Y., will send their pamphlet, describing water works machinery, and containing reports of tests, on application.

Curtis Pressure Regulator and Steam Trap. See p. 77.

Pedestal tenoner. All kinds woodworking machinery. C. B. Rogers & Co., Norwich, Conn.

Billings' Patent Adjustable Four and Six Inch Pocket Wrenches. Billings & Spencer Co., Hartford, Conn.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

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Practical working drawings of machinery made by A. K. Mansfield & Co., 280 Broadway, N. Y. Correspondence invited.

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NEW BOOKS AND PUBLICATIONS.

A TEXT BOOK ON ROOFS AND BRIDGES. Part I. Stresses in Simple Trusses. By Mansfield Merriman. New York: John Wiley & Sons. Pp. 118. Price $2.50.

The author, a professor of civil engineering in the Lehigh, Pa., University, presents in this volume a synopsis of one of four parts of the course of instruction followed in that institution. The book is more especially for the use of students intending to take a thorough course in civil engineering, and each alternate leaf throughout the book has been left blank for convenience in recording solutions of problems.

THE AMAZON PROVINCES OF PERU AS A FIELD FOR EUROPEAN EMIGRATION. By H. Guillaume, F.R.G.S. London: Wyman & Sons. 1888. Pp. xvi, 309. Price $2.00.

This work, dedicated to one of the rival aspirants to the governing of Peru, General Andres Avelino Caceres, is the work of the Peruvian Consul-General at Southampton. It treats at considerable length of the ethnology, natural history, topography, and other features of the region lying on the eastern slope of the Andes, and is designed to encourage emigration thereto. The work is well and characteristically illustrated, with various views. Its frontispiece is a portrait of Caceres, whose star has lately been in the ascendant. The work presents a clear and striking picture of the country and its prospects, both as a mineral-producing territory and from other points of view.

MECHANICAL DRAWING. By Linus Faunce. Boston: W. J. Schofield. 1887. Pp. 136. Price $1.25.

This excellent little work, designed for the use of the students of the Massachusetts Institute of Technology, may be safely recommended to all students of this branch of science. It abounds in practical notes, and deals largely with the solution of problems in geometrical graphics. Shadows and projection are likewise treated at considerable length, and make the whole a compact yet full treatise on its important subject.

A COURSE OF LECTURES ON ELECTRICITY. By George Forbes. London: Longmans, Green & Co. 1888. Pp vii, 163. Price $1.50.

This attractive and excellent little work is a welcome addition to the somewhat numerous list of works on the elements of electrical science. Many of the illustrations are naturally old time productions, the acquaintances of past years, but the main tone of the text is quite in accord with the last developments of the day. The treatment is popular and attractive. Mathematics, to many the great bugbear of the scicnce of to-day, are omitted, and experimental demonstrations are made to take their place. We recommend the work to our readers, believing it adapted to fill creditably its place in electrical literature.

STEAM BOILER EXPLOSIONS, IN THEORY AND PRACTICE. By R. H. Thurston, M.A., Doc. Eng. New York: John Wiley & Sons. 1887. Pp. vii, 173. Price $1.50.

The name of the author carries with it the best guarantee of the value of this book. It is well illustrated, and treats of the subject from every standpoint. The theory is considered and a series of conclusions reached that are based largely on the well known Stevens experiments at Sandy Hook. His eighth conclusion contains the gist of the matter, and is a capital commentary on the sensible and practical way in which the writer deals with his material: "That all explosions are certainly due to simple and preventable causes, and nearly all to simple ignorance or carelessness, on the part of either designer, constructor, proprietor, or attendants." Next, the author disposes in a few words of the prevention of explosions, stating it to be a matter of the utmost simplicity. The work should be studied by all engineers, especially by the working staff, who are so fond of indulging in theories that are utterly unproved, and in making a mystery of the causes that bring about the rupture of iron plates.

THE VOSBURG TUNNEL: A DESCRIPTION OF ITS CONSTRUCTION. Illustrated. By Leo von Rosenberg. New York. 1887. Pp. 56. Price $1.

This elegantly printed monograph details the methods of construction adopted in the construction of the Vosburg tunnel on the Lehigh Valley Railroad. To Mr. Von Rosenberg had been entrusted the making of a complete series of drawings of the tunnel work. He has now published, with special permission of the Lehigh Valley Railroad Company, a collection of these drawings, and in the 56 pages of text has fully explained them, and has given practical points and figures and statistics. The whole thus acquires character as an exponent of modern successful tunnel practice, and should be found in every railroad engineer's library.

ZWICKER'S INSTRUCTOR FOR PROCURING STATIONARY AND STEAM ENGINEER'S LICENSE. By Philip Henry Zwicker. St. Louis, Mo. 1887. Pp. 84. Price $2.

This work, in a series of questions and answers, aims to give the instruction indicated by its title. It will be found useful reading for aspirants to a knowledge of practical engineering.

POROUS EARTHENWARES. Facsimile of United States Letters Patent issued to Charles Carroll Gilman. 1887.

This book comprises facsimile reproductions of thirty-three patents granted to Mr. Gilman. No comments are given, but each patent is allowed to speak for itself. The publication presents a novel and interesting appearance. It is a characteristic way of illustrating the life work of an inventor.

☞ Any of the above books may be purchased through this office. Send for new catalogue just published. Address MUNN & Co., 361 Broadway, New York.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) W. D.—In casehardening gun trimmings and locks the articles should be packed in a wrought or cast iron box with a cover so arranged as to allow of the use of clay to lute it as nearly tight as possible. To produce the mottled appearance, use bone black or burnt bones pulverized, which give a gray color to the metal, and burnt leather pulverized, which gives a blue color. Mix the two materials loosely as you pack the articles to produce the mottled appearance. When packed and the cover luted, the box is to be heated to a low red in a furnace or forge fire, and kept at this temperature from ¾ to 1½ hours, according to to the depth of casehardening required. Then raise the box to a cherry red heat for a few minutes, long enough to allow the hardening heat to penetrate to the center of the box, when it can be opened, the pieces picked out and dipped in water at ordinary shop temper and quickly dried, or if there are many pieces the box can be tipped and the contents dropped into the hardening tub.

(2) F. C. H. asks: 1. What is meant by "boxing the compass," also by boxing it backward? A. To box the compass is to call the 32 points of the compass by their proper names toward the right hand as you look at the compass card, or from north by the east. As for example, N., N. by E., N. N. E., N. E., N. E. by E., E. N. E., E. by N., E., and so on. Boxing backward is reversing the order. 2. How can I find out the desired horse power to run a certain machine? And when I have the horse power, how shall I find the size of cylinders I need (there being two) for an oscillating engine? A. Find the power required for any given machine with a dynamometer. They are for sale by the engineering trade. You cannot compute the size of the cylinder directly from the required horse power. Steam pressure, speed, mean pressure from cut-off, and relative length of stroke and diameter of cylinder, all have to be considered in arriving at the required result. You will find the nominal sizes of cylinders for given powers of engines tabulated in the circulars of dealers.

(3) W. J. B. asks: What can I put into a cement I now make to keep it from becoming neutralized? It is made by boiling acetic acid, then mixing into it gelatine until it becomes thick. It makes a very good cement, but after it is made awhile it loses its sticking properties and gets like oil. A. You probably don't keep it tightly corked. The best liquid glue is said to be made from the following receipt: Take a wide-mouthed bottle and dissolve in it 8 ounces best glue in ½ pint water, by setting it in a vessel of water and heating until dissolved. Then add slowly 2½ ounces strong nitric acid 36° Baume, stirring all the white. Effervescence takes place with generation of fumes. When all the acid has been added, the liquid is allowed to cool. Keep it well corked.

(4) J. T. W. asks concerning some preparations which will preserve "string netting." I have inclosed my chicken yards with a 4 ply string net, and as the climate here is wet, I am afraid it will soon rot. A. Dissolve 1 pound of sulphate of zinc in 40 gallons of water, and then add 1 pound of sal soda. After these ingredients are dissolved, add 2 ounces tartaric acid. The net should be soaked in this solution for 24 hours and then dried without wringing.

(5) J. H. U. desires a prescription for earache. A. Consult a physician. It is dangerous to treat such troubles without competent advice. 2. A receipt for paste which would make labels stick fast to tin boxes. A. Use starch paste with which a little Venice turpentine has been incorporated, while it was warm.

(6) C. M. desires the receipt and quantities for making 50 gallons of javelle water. A. Javelle water is best made by passing gaseous chlorine into a solution of 1 part of carbonate of potash in 10 parts of water until the gas ceases to be absorbed. It may also be made by adding a solution of carbonate of potash to a solution of chloride of lime, with agitation, as long as a precipitate forms, the liquid being afterward decanted or filtered off. See also SCIENTIFIC AMERICAN SUPPLEMENT, No. 314.

(7) D. L. W. asks: What will kill the smell of turpentine without affecting its strength? A. Try filtering through bone charcoal, but we doubt whether anything will prove effectual.

(8) J. P. B. recommends the following as an excellent blacking for brass or wood work: Take a little bit of good black printer's ink (with a very little turpentine to moisten it enough) and blacken any kind of wood or metal. When it gets hard, it will adhere firmly, and dries flat.

(9) A. L. B. asks for a lacquer for a brass instrument that has become somewhat tarnished, it must be of a lemon or orange tint. A. Take 1 part of finely broken shellac to 4 parts strong alcohol, let it stand in a warm place with plenty of shaking for about 24 hours, one-fifth to one-tenth part of mastic may be added. If it needs filtering, it must be done, but through coarse filtering paper. A little gamboge for yellow, or dragon's blood for red must be added. Apply the varnish to the hot metal, which must be absolutely clean and untouched by the fingers. Apply the brush with strokes parallel to the streaks of the metal.

(10) J. E. McK.—Wood begins to be dangerously hot at 300° F. Drying rooms should never reach this limit, 150° to 215° F. should dry barrel stock very fast, and 215° should be the limit of heat in the lumber room. Excessive heat cracks the lumber.

(11) L. C. D.—Picture frame maker's putty is made of whiting, glue, and water, worked very stiff. The mould is oiled. If you wish it to dry slow, put a few drops of glycerine in the back of putty.

(12) E. B. asks how to set a carriage axle or a wagon axle. A. Make the bottom side of the bearings or skeins a straight line, and give a slight set forward, so that the distance between the front of the rims of two wheels will be ⅛ to 1 inch less than between the backs.

(13) P. J. H. asks the names of the different sections of a globe valve. A. Body, seat, bonnet, stuffing box, nut or gland, spindle, valve disk, valve nut, wheel.

(14) J. C. P. asks: 1. How many candle power does the inexpensive arc lamp described in the SCIENTIFIC AMERICAN, vol. 56, page 374, give? A. From 40 candles upward. It needs constant personal attention. 2. How many cells of the simple plunge battery of vol. 57, page 116, would it take to light the arc lamp for three hours every night? A. From 30 cells upward. 3. Of the simple plunge battery, does one tumbler mean one cell? A. Yes. 4. How many cells of the single fluid battery, vol. 57, page 390, of the gallon size will it take to light the arc lamp? A. From 20 cells upward.

(15) A. W. S. asks: 1. Could the eight light dynamo given in No. 17 of the SCIENTIFIC AMERICAN of 1887 be changed to a motor by winding the armature and field magnet with a different size of wire? If so, what size of wire would have to be used, and how many pounds for each? A. The dynamo referred to makes a good motor without any alteration. 2. What size of wire would have to be used for a motor, on same floor, only half size, or one-fourth the power? A. You should preserve about the same proportions throughout all the parts of the machine, including the wire.

(16) C. H. U.—There are three trees popularly called "umbrella tree." The one which you inquire about appears to be, from your description, a variety of the *Melia azederach*, which forms a dense round head, flattish underneath, which, viewed from a distance, somewhat resembles an open umbrella. The two other umbrella trees are species of magnolia.

(17) W. S. A. asks what a candle power is, or what is the basis; upon what is a candle power based? A. A candle power is the light given by a sperm candle burning 120 grains per hour. It is an extremely crude standard, but by the adoption of a known type of candle has acquired some accuracy.

(18) E. H. writes: We have a cross belt in our shop that is heavily charged with electricity. How can the circuit be completed, so that it will give a person a shock? This belt will draw sparks from a person's finger tips at a distance of from 3 to 4 inches, and the only effect felt is a sharp stinging at the point from which the sparks issue. The other day a party came in and held his fingers up to the belt, and if we touched him in that position, we would receive a shock, but this only answered for this one person, and would not do for any one else, and, in fact, when he came in a day later, it would not do it again with him. Can you through your columns give us any information in relation to the phenomena? A. To get a shock by means of your belt, charge a Leyden jar with it by holding the knob in its vicinity. Possibly the clothing of the person who gave a shock had something to do with the phenomenon.

(19) S. K. M. asks: 1. How should Holtz machine be altered to use Topler's plan? A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 291. 2. How is luminous paint made? A. See articles on this subject in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 249 and 497. 3. How is ink for type writer ribbons applied? A. Lay out the ribbon in such lengths as may be convenient, and apply the ink after agitation by means of a soft brush, rubbing it well into the interstices of the ribbon with a stiff tooth brush. Hardly any ink should remain on the surface.

(20) J. W. desires (1) a cement suitable for cast iron. A. Mix powdered cast iron bore chips, 60 parts, salammoniac 2 parts, flowers of sulphur 1 part, and stir the mixture into a stiff paste by adding water. The cement must be used while fresh. 2. Is there a positive cure for freckles that will remove them without injury to the skin? A. There is no positive cure, but you might try ½ drachm ammonium chloride and 2 drachms laveudar, in half a pint of distilled water. This mixture may do some good. Apply to the face two or three times a day with a sponge.

(21) F. C. H. asks (1) how to clean velvet collars on overcoats. A. See SCIENTIFIC AMERICAN SUPPLEMENT No. 158. 2. How to take off the traces of a sheet iron stove done by the scratching of matches? A. Use stove polish. 3. Could the simple telephone described in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 142, be used for a transmitter, and could I use No. 20 cotton covered wire for the line? For a short line could I connect one wire with the water pipe? A. Yes; but you had better use a closed metallic circuit.

(22) F. E. D. desires a recipe for skeletoning and bleaching leaves. A. See "How to Prepare Skeleton Leaves and Grasses," contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 270.

(23) W. P. P. asks how to remove the copper from electric light carbons. A. Use nitric acid.

(24) M. N. O. asks how to remove India ink marks that have been pricked in a person's arm or hand. A. It is impossible to take them out completely. Their intensity may be modified by several times pricking them over with milk.

TO INVENTORS.

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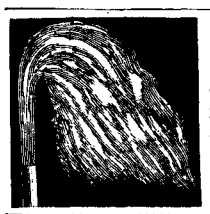

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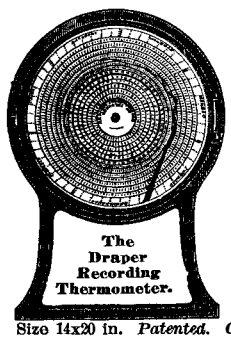

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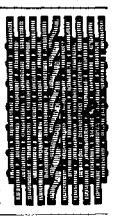

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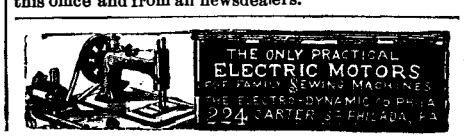

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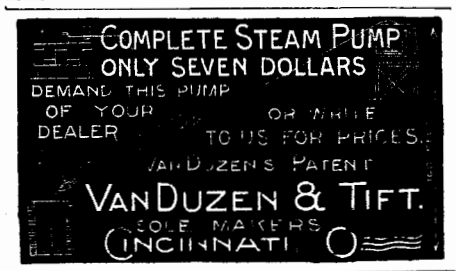

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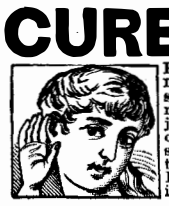

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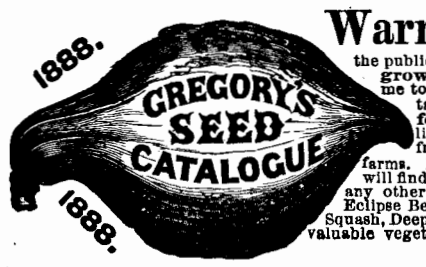

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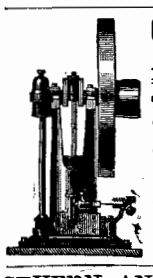

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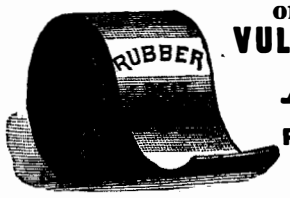

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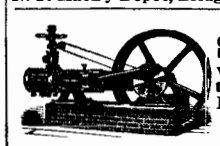

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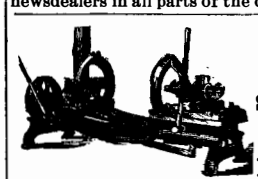

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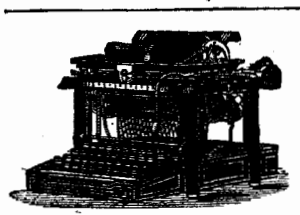

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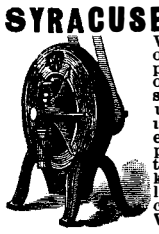

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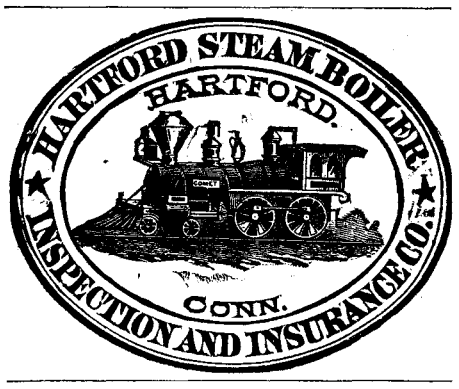

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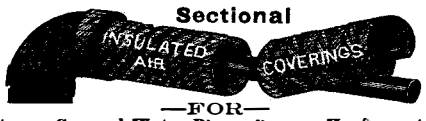

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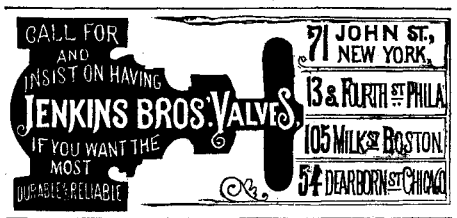

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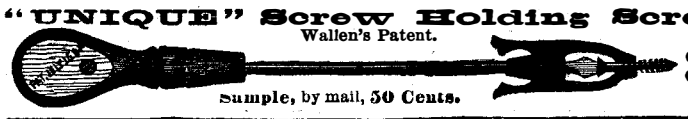

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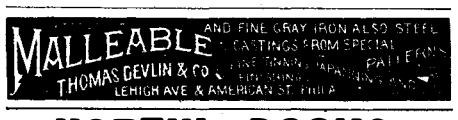

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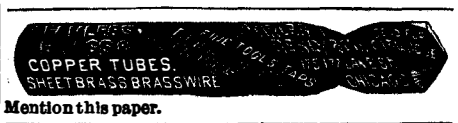

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